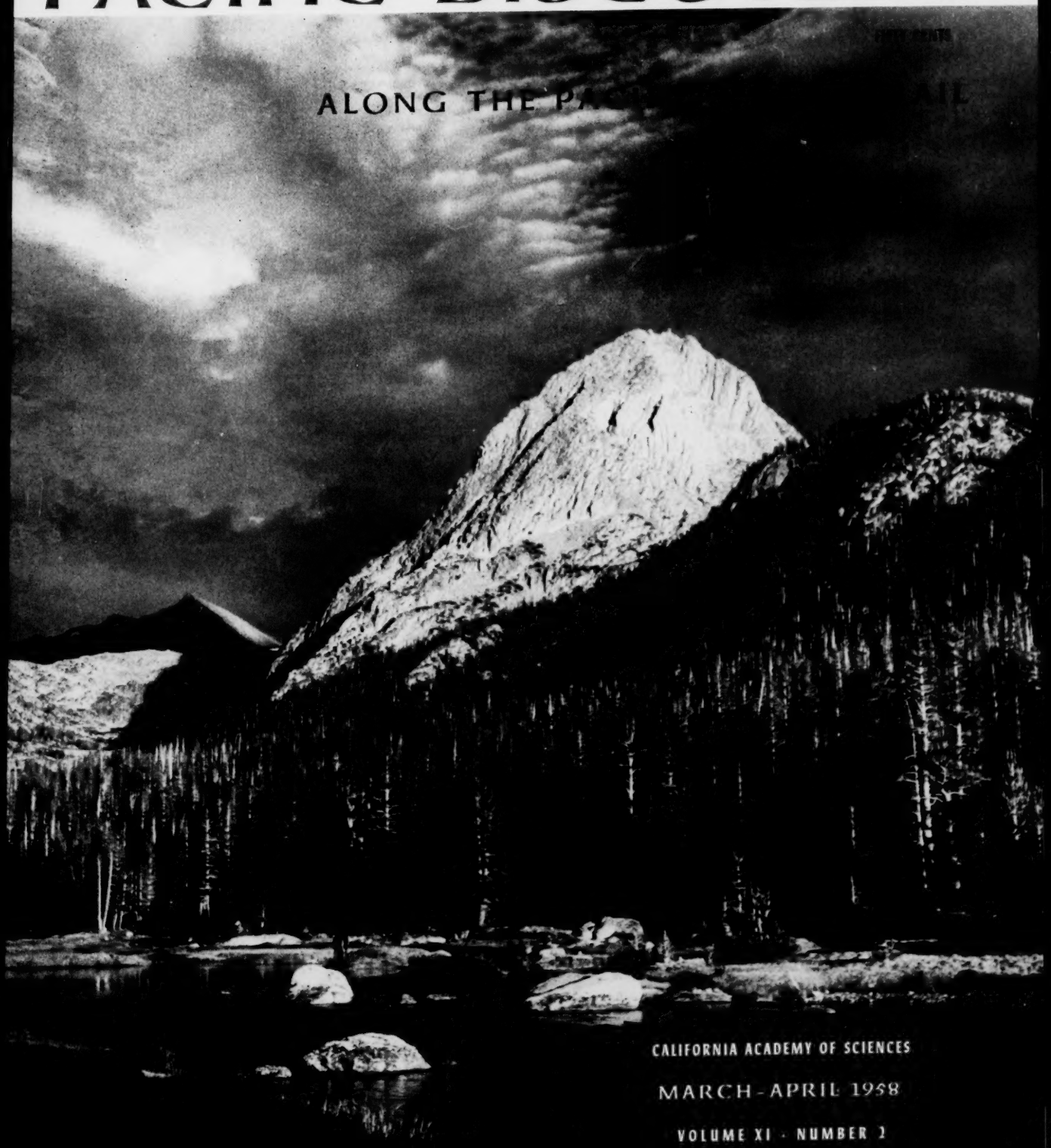
PACIFIC DISCOVERY



CALIFORNIA ACADEMY OF SCIENCES

MARCH-APRIL 1958

VOLUME XI · NUMBER 2

VOLUME XI • NUMBER 2
MARCH-APRIL 1958

PACIFIC DISCOVERY

Editor and Art Director: DON GREAME KELLEY; *Managing Editor:* ROBERT C. MILLER; *Associate Editors:* IRA L. WIGGINS *(Stanford University)*, A. STARKER LEOPOLD *(University of California)*; VERONICA J. SEXTON, BENJAMIN DRAPER, ROBERT T. ORR, ALLYN G. SMITH *(California Academy of Sciences)*; *Special Correspondent:* THANE RINEY *(Wellington, New Zealand)*
Advertising and Circulation Manager: GARY B. BARRETT

PRE-DISCOVERY

AMONG THOSE WHO firmly believe Drakes Estero to be the place where Sir Francis Drake put ashore in California and careened the *Golden Hind* is Fleet Admiral Chester W. Nimitz, resident of Berkeley. In his article in this issue, Admiral Nimitz makes use of research material gathered by the Drake Navigators Guild, of which he is a member. For a number of years, the Guild has been engaged in collection of information, records and artifacts and in research with which they hope to definitely pin down the California landing of Drake. Some of the choice artifacts, photographs, records and other material will make up an exhibit on "Drake in California" which the Academy will put on display about the time this issue comes off the presses. The exhibit will not favor Drakes Bay, San Francisco Bay or any other California landing but will display the fascinating evidence that the intrepid admiral was a visitor to the new world long before Plymouth or Jamestown were founded.

In this issue, also, the first report sent from the South Pacific by roving reporter Don Greame Kelley appears. He gives his impressions of the Ninth Pacific Congress in Bangkok and also writes that his dreams about and expectations of the glorious ruins in Angkor were more than fulfilled. In a future issue, *PD* will carry an amplified report on his reaction to the magnificence of Angkor Wat, Angkor Thom, Prah Khan and the other temples.

Most persons have in their minds one specific country or area which continually exerts an influence. It may be Angkor, Brazil or Key West. For those whose eyes turn northward, the next issue of *Pacific Discovery* will explore some facets of the Yukon and Alaska.

IN THIS ISSUE

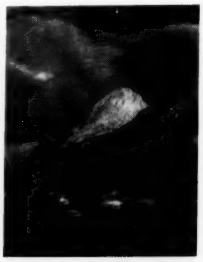
EDITORIAL: *Pros and Cons of Conservation* 1
San Francisco Bay: The Living Water
HAROLD GILLIAM 2
Pacific Crest Trail
WELDON F. HEALD 6
Drake's Cove—A Navigational Approach to Identification
CHESTER W. NIMITZ 12
An Earwig that Likes Bats
M. W. F. TWEEDIE 21
They Put Snakes to Work for Mankind
PHILIP FERRY 22
ROADS TO DISCOVERY: *The Editor in Asia*
DON GREAME KELLEY 26
ASTRONOMY: *Landscapes of the Future*
CHARLES F. HAGAR 29
REVIEWS 32
FROM THE READER 33

PD'S AUTHORS

NATIONAL WILDLIFE WEEK is March 16 to 22 and California Conservation Week is March 7 to 14. In observance of these occasions, Managing Editor **Robert C. Miller** unlimbers his busy pen to write about the pros and cons of conservation. It is, of course, a consideration which must be kept in mind the year-round but for these two special weeks, Dr. Miller reminds us how important the right kind of conservation is. . . . ¶Again **Harold Gilliam's** byline appears in our pages, as we publish another excerpt from his excellent (and best-selling) *San Francisco Bay*. A portion of Chapter 7, the excerpt deals with the living creatures to be found in and around the bay. . . . ¶One of the most beautiful trips in America or any other part of the world is along the Pacific Crest Trail which **Weldon F. Heald,** frequent *PD* contributor, shows in pictures and text. . . . ¶Fleet Admiral **Chester W. Nimitz,** U.S.N., is a newcomer, and a most welcome one, to the roster of *PD's* authors. He writes about another famous admiral, Sir Francis Drake, and presents the case of the Drake Navigators Guild for designating Drakes Estero as Drake's California landing spot. We're afraid we can't possibly resist the temptation to say, "Welcome aboard, Admiral Nimitz.". . . ¶**M W. F. Tweedie** appears again in this issue with pictures and text on an unusual earwig. . . . ¶On a recent trip to another harbor, **Philip Ferry,** another frequent *PD* contributor, picked Bangkok, Thailand as one of his favorite places. In that city, he visited and here describes one of that city's popular and worthwhile attractions. . . . ¶Under the *Roads to Discovery* banner, **Don Greame Kelley's** first report concerns a conference of dedicated scientists putting nationalism in limbo to concentrate on scientific advancement for the entire world. Editor Kelley also found architectural splendors in quantity in Cambodia. . . . ¶**Charles F. Hagar,** assistant Curator of Astronomy at the Academy, writes down a recent interview with one of this world's best-known "other-worldly" artists.

Copyright 1958 by California Academy of Sciences

THE COVER



AFTER THE STORM, a sunset in McClure Meadow in Kings Canyon National Park, along the route of the Pacific Crest Trail. Photo by Weldon F. Heald. (See also pages 6-11.)

Pacific Discovery is published bimonthly at Gillick Press by the California Academy of Sciences. Publication office: 2057 Center Street, Berkeley 4. Editorial, Advertising and Circulation offices: Golden Gate Park, San Francisco 18. Annual subscriptions: U.S., $3; Foreign, $3.50. Single copies, 50¢. Members of the Academy subscribe through their dues. Entered as second-class matter, February 17, 1948, at the Post Office, Berkeley 4, California, under the act of August 24, 1912.

EDITORIAL

Pros and Cons of CONSERVATION

EVERYBODY BELIEVES in conservation. The difficulty is to agree on what to conserve, and how, and why. The hardy hiker and mountain climber wants to conserve "wilderness areas" which can only be visited by strenuous effort; the week-ender and the tourist want woods that they can drive through with an automobile, and argue that we should conserve for the enjoyment of the many rather than the few. The nature-lover wants to conserve swamps and marshlands as breeding places for wildfowl; the reclamationist wants to conserve swamps by draining and converting them into fertile farm land. The bird-lover wants to conserve robins, the farmer wants to conserve his cherries. The Audubon Society wants an abundance of ducks to look at, the sportsmen's clubs want an abundance of ducks to shoot at. And so it goes. Each group looks at conservation from the standpoint of its own particular interest or hobby, and little dispassionate consideration is given to the problem of conservation as a whole.

Most difficult to resolve is the conflict between those who believe in "wild nature" and those who believe that man, by judicious effort, can definitely improve on nature as he finds it. The naturalist wants his woods full of dead snags to harbor woodpeckers, fallen trees to shelter insects and salamanders, and dense undergrowth to provide food and lodging for towhees, thrushes and song-sparrows. The trained forester, equally earnest and sincere, shudders at dead snags, regards rotting logs as criminal waste, considers underbrush a fire hazard, and would like to see the forest looking substantially like a well-kept orchard.

Two extremes are represented by the man who believes that conservation consists in letting nature strictly alone, and by a friend of mine who once remarked, "Nothing in nature is so beautiful to me as a broad expanse of well-kept lawn." Neither of these persons means exactly what he says. The former would be pretty much annoyed if he had to fight his way to the grocery store through a thicket of devils club — knowing, indeed, that if nature were let sufficiently alone, there wouldn't be any grocery store in the first place! And my grass-loving friend would soon tire of lawns if he saw nothing but acres and square miles of them.

Man's contact with nature inevitably brings about changes, and those changes are not necessarily for the worse, nor always to be deplored. Why wax eloquent over a beaver dam, and consider a Bonneville Dam an excrescence on the face of nature? Is the flight of the Pacific Golden Plover from Alaska to New Zealand any more remarkable than the flight of the Pacific Clipper from San Francisco to Macao? If man be a part of nature, as biologists and educators teach, it does not seem entirely logical to regard his activities as an unfortunate impingement on the natural order.

Improvements sometimes referred to as "artificial" frequently bring about a definite increase in bird and animal life. An outstanding example is furnished by Golden Gate Park in San Francisco. This famous park of a thousand acres was "artificially" created by scientifically planting a waste of sand dunes along the ocean shore. Today this area, in addition to supporting nearly four thousand species of native and exotic plants, provides a habitat for perhaps a hundred kinds of birds — certainly more than twice the number of species and many times the number of individuals originally found there.

It could reasonably be argued, I think, that if a square mile of forest were cut down, cleared, plowed, and devoted to diversified farming, the bird population would not become smaller, but only different. Instead of kinglets, juncos, chickadees and tree-creepers we should find robins, barn swallows, meadow-larks and blackbirds. The total bird population might well be the same, or even larger than before.

All this may be freely admitted; yet no intelligent lover of outdoor life or natural beauty wishes to see the whole world brought under cultivation, whether for the purposes of parks, agriculture, or scientific forestry. Our lives call for variety; and there is a beauty and variety in untamed nature which can never be duplicated by man.

Furthermore, in spite of all of his study, man does not yet know nearly enough about nature to be sure that in his efforts at conservation he is always doing the right thing. Killing eagles, hawks, owls and snakes may result in an increase in "game," but it will certainly cause an increase also of such pests as rats, mice, prairie dogs and gophers. Destroying coyotes appeared commendable until it resulted in a plague of jack-rabbits. Plowing up the prairies for wheat ranches seemed a good idea at the time, but it turned thousands of square miles into a "dustbowl."

True conservation implies not only the protection of natural resources for prolonged or permanent use — such things as scientific management of fish and game, scientific agriculture to prevent soil depletion and soil erosion, scientific forestry practice to conserve water power, prevent floods, and provide lumber indefinitely through a policy of sustained yield. It means also the setting aside wherever possible of "wilderness areas," large and small, where wildlife may perpetuate itself unaffected by the encroachment of man, where conditions may as far as possible remain unchanged, and where scientists of today and of the future may study the "balance of nature" and the interrelations of different species in the feral state.

Man has more ability than any other creature to alter his environment. Let us hope that he has also enough wisdom to let part of it alone! R.C.M.

The above editorial, written for the Washington State Conservation Week in 1939, has long been out of print. It is reprinted here in recognition of California Conservation Week, March 7-14, and National Wildlife Week, March 16-22.

SAN FRANCISCO BAY: *The Living Water*

COMMUTERS on a Berkeley ferry one day in 1934 were startled to see the shape of a huge animal rise from the water not far from the boat. It submerged again before it could be identified, but some of the passengers were convinced that they had seen a sea monster.

A few days later the same or a similar "monster" was spotted off Richmond. Unfortunately no one had any cameras handy at either appearance and there were no experts present to identify the beast, so the bay's only monster legend will always be unauthenticated. Although it is possible that the observers' imaginations were working overtime, it is also possible that the "monster" label was not far wrong. Rare varieties of whales and other giants of the deep have been found in the bay, and how many others cruise these waters unseen will never be known.

Only at such rare intervals when a strange form of life penetrates the surface does it come to public notice that the bay contains more than water. Actually no major city in the Western world is in such close contact with primitive life on a large scale as is San Francisco. In terms of the density of animal life it is as if the city were enclosed on three sides by the jungles of the Amazon. Though three million people live around the bay's shores, the non-human population of the bay itself is at least a million times as great. . . .

Residents of the Bay Floor

Scoop up a bucketful of water from anywhere in the bay, and the chances are good that it is swarming with plankton — minute organisms of many varieties, some barely visible, some microscopic. The plankton includes the progenitor of all animal life — the Protozoa, literally "first animals." This is the Beginning. Between the single cell of the Protozoa, drifting at random in the bay's waves and deeps, and the single human being standing on its shore, lies a gap of more than a billion years.

A slightly lesser gap separates man from another form of life in the plankton, the larvae, jellyfish-like substances which are the first stage in the development of many marine animals. If a mollusk larva, for example, is lucky enough to escape the gaping jaws of hungry fish, it will settle down on a rock or sandy bottom, grow a shell, and become a full-fledged clam, mussel, oyster, or snail. It may then turn the tables and devour other passing larvae with no discrimination whatever, often cannibalistically making meals from the larvae of its own species. . . .

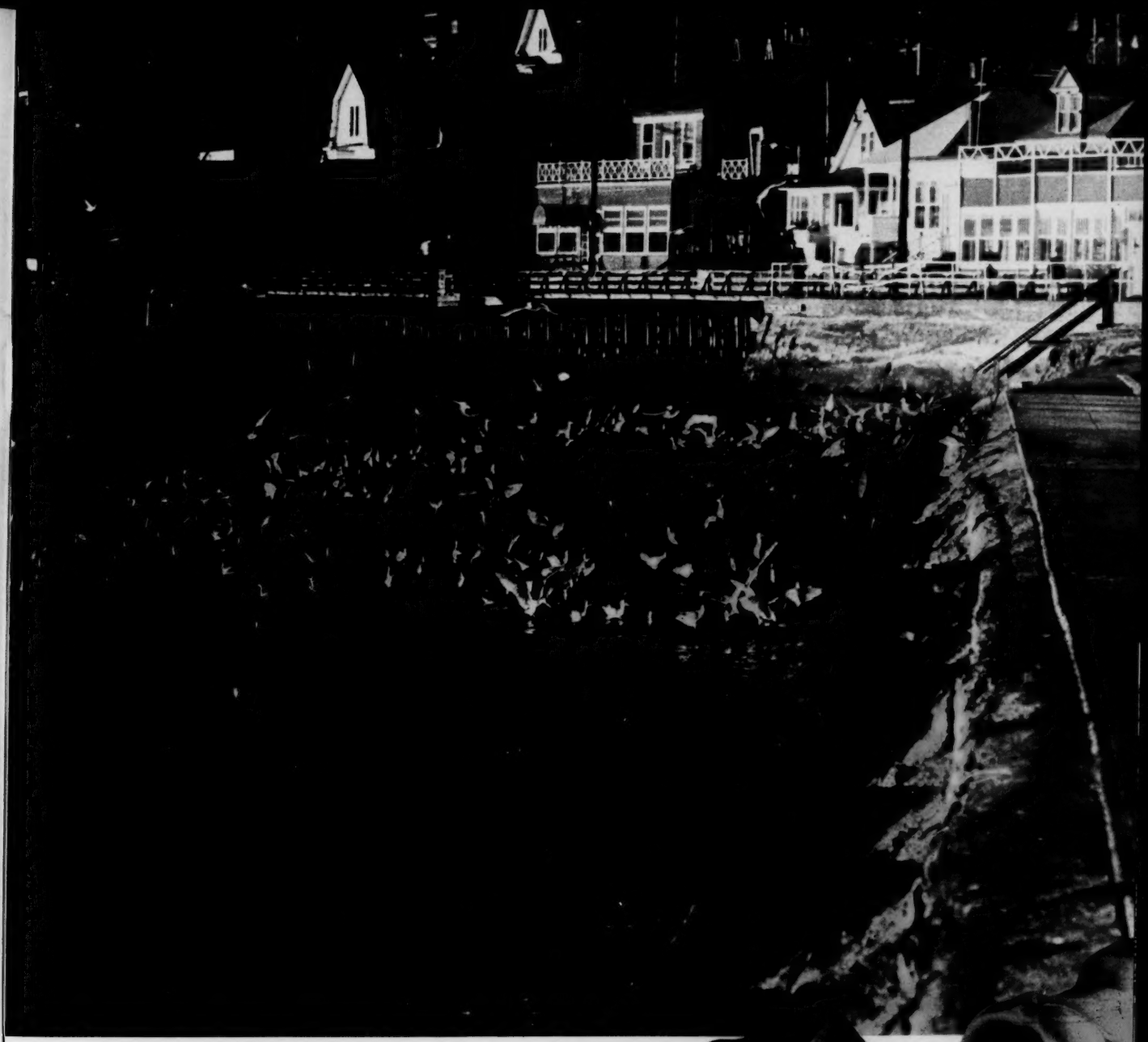
Of all the forms of animal life in the bay the champion breeder and holder of all population records is the tiny jewel clam, named for its size rather than any other resemblance to a gem. Like other clams it prefers muddy bottoms, but unlike many other varieties it is too small to attract the most voracious predator of all — humans. The succulent little-necked clams, up to four inches long, are far more vulnerable and are scooped up in bucketloads by clam diggers when minus tides leave bare the mud flats around the bay's edges at places like Richardson Bay in Marin and Coyote Point near San Mateo. This variety was doubtless responsible for the proverb about the happiness of a clam at high tide. Steamed or chowdered, it makes a tasty dish. . . .

A clue to one of the great mysteries of marine life — the migrations of fish — may be found in the behavior of one of the clam's near relatives, the mussel. The bay mussel, a black-shelled mollusk which clamps itself firmly to rocks or pilings, is a species distinct from those outside the Gate, and its spawn forms one of the most important food sources for the bay's fish. In the spring, influenced by unknown forces — possibly changes in the bay's salinity or temperature — it throws out vast quantities of cells called gametes, which combine to form the mussel larvae. Biologists speculate that this great seasonal larva production of the mussels may determine in some degree the migrations of the fish which depend on it for food. . . .

Scuttling across the bay floor at all depths are dozens of kinds of crabs, including the famed hermit crab, a small variety which takes up residence in the discarded shells of other animals, principally snails. In his choice of a home the hermit is not too discriminating, however, and will accept a low-grade substitute; in captivity he can be satisfied with a metal ring around his middle, apparently under the delusion that he is comfortably housed in a shell.

Even more renowned than the hermit is another crustacean, the *Crago franciscorum,* the bay's own unique form of shrimp. Hauled up in

"San Francisco Bay" by Harold Gilliam is still high on many persons' "must-read" list. Reprinted here is an excerpt from the chapter on wildlife in and around the bay, copyrighted 1957 by Harold Gilliam.



HAROLD GILLIAM

Some of San Francisco Bay's myriad numbers of Western gulls here wrangle over herring eggs at the Sausalito shoreline. At right are smaller but even more numerous residents, teredos or shipworms, wormlike mollusks with an insatiable appetite for the hulls of wooden vessels or the bay's wooden pilings. Top photo by Cecil Tose, right by Robert C. Miller.

fish nets by the millions, this tiny bottom dweller is prized by many gourmets as far more tender and tasty than the bigger ocean-going shrimp. Humans are not alone in their appreciation of the savory *Crago franciscorum;* it forms a staple item in the diet of most of the bay's fish population. . . .

Dangerous Customers

During World War I unexplained disasters began to strike harbor installations. Piers with loaded freight cars collapsed into the bay, and ferry wharves began to fall apart. Enemy action was suspected. Investigation proved that the bay had indeed been invaded by an enemy—the shipworm, or teredo. This clamlike mollusk, which had plagued mariners since the times of the Greeks and Romans by burrowing into the hulls of wooden vessels, had developed an insatiable appetite for the bay's wooden pilings.

Old pilings were replaced by new ones chemically treated to resist the hungry shipworm, but not before the little mollusks had gobbled up millions of dollars worth of wharves. The shipworm problem is still an acute one in those areas above Carquinez where pilings originally built in fresh water—in which the shipworm cannot live—are attacked by the animals in dry seasons when the river flow diminishes and the salt water advances. . . .

Singers, Stripers, and Whoppers

Although no one has ever taken a census of the bay's fish, the nearest approximation was a tally kept over a period of several years by California Academy of Sciences biologists. They enumerated fish caught in the nets of Chinese shrimp fishermen off Oakland and in the screens of the Pacific Gas and Electric Company's steam plant in San Francisco. Altogether more than seventy species have been identified. Varieties not caught in either place would possibly bring the total close to one hundred.

The population record is held by the surf perches, which far outnumber all other fish together. A peculiarity of these little fish, seldom more than a few inches long, is that they lay no eggs but are viviparous, bearing their young alive — a fact which amazed the biological world when it was first discovered in this bay many years ago.

Ranking second is the staghorn sculpin, often called the "bullhead," followed in numbers by the Pacific herring, which enter the bay in great schools in the winter to spawn, leaving large areas of the surface coated with their eggs; the bocaccio, a "rock cod" whose name literally means "big mouth"; the San Francisco topsmelt; the tom cod; the midshipman; and the striped bass. . . .

Air-borne Residents

A fascinating link in the bay's evolutionary scale is the cormorant. Observers are sometimes surprised to see a snaky neck and head scooting along in the water as if it belonged to some fast-swimming reptile. The cormorant's black body floats so low that it is scarcely visible. He may dive for a fish, disappear for perhaps a minute, then emerge gradually, trailing his tail in the water and beating his wings violently to get enough speed to become air-borne.

His meal finished, he is likely to perch on a rock, wings outspread, waving them slowly to dry, as if being in the water like a lower form of life were really a distasteful business he would prefer to forget. At low tide Alcatraz rock, just west of the island, is a favorite perching spot.

Great flocks of these birds can often be seen flying low over the water in single file, wings beating swiftly, heading for their roosting areas at such places as Brooks Island and Red Rock, where they congregate by the thousands.

The cormorants are the birds exploited in the Orient by fishermen, who keep them on a leash; a noose around the bird's neck prevents him from swallowing the fish he catches, and the fisherman retrieves it. Any fisherman attempting this practice in the bay, however, would doubtless hear from the S.P.C.A.

At the opposite end of the scale from the primitive cormorant is the glamour bird of the bay, the egret. This tall white member of the heron family can often be seen wading in the shallow areas around Richardson Bay Bridge and on similar marshy shores. The big bird often reaches three feet in height and has long white plumes, a near-fatal attraction. The feathers were long used as adornments for ladies' hats, causing the birds to be hunted almost to extinction. Legal protection — and changing fashions in headgear — eventually allowed the birds to make a comeback.

The marshes frequented by the egrets are rapidly being filled for subdivisions, however, and many of the birds, like the Indians before them, have retreated to an island redoubt — the smaller of the two Marin islands off San Rafael. But even there they are not secure and on occasion have

been easy prey for teen-agers with shotguns. Fortunately the birds inhabit the island in such great numbers that the illegal raids have not as yet made serious inroads on their population.

Of the eight varieties of sea gulls which can be seen over the bay – following fishing boats in droves, cleaning the beaches of refuse, nesting on rocks and on girders of the Bay Bridge – the only permanent resident is the Western gull, a large white bird with gray back and wings. The other species stay in this region during the winter only, roosting by the thousands on the roofs of piers, and take off in the spring for distant parts, some for areas farther north along the coast, some for lakes in the Sierra, some for such an inland spa as the Great Salt Lake. Probably some of the bay's gulls were among those which saved the Mormon crops from grasshoppers a century ago and were immortalized by a monument in Salt Lake City.

The bay's diminishing marshlands are way stations for dozens of other varieties of shore birds who stop here on their twice-a-year migrations. Bay Farm Island, just south of Alameda, has long been one of the great bird resorts of the West, populated in season by many varieties of sandpipers, avocets, willets, godwits, plovers, killdeer, curlews, and many others. Occasionally bird enthusiasts are thrilled by catching a glimpse of rarer species such as Wilson's snipe or the phalarope, a small sandpiper-like bird with an odd habit of spinning like a top as it sits on the water.

Great flocks of ducks winter here, too – mallards, pintails, canvasbacks and half-a-dozen other varieties which come south from the lakes and bays of Canada and Alaska to spend the winter in the bay's more hospitable climate. Sometimes, however, their welcome is less hospitable than the weather; around the shallow edges of the bay are scores of sheds and duck blinds which in season hide hunters looking forward to a wild-duck dinner.

The long-distance champion of the migrants is the arctic tern, a bird which resembles a sea gull in appearance but flies with rapid wingbeats, hovering in one spot over the water like a hummingbird, then diving quickly to snare a fish. He does not linger around the bay, however, stopping only for a bite to eat on his semi-annual trip from pole to pole.

Even more spectacular as a diver, because of his greater size, is the big brown pelican, a year-round resident who soars over the bay scarcely batting a wing until his keen eyes detect a possible meal just beneath the surface. Then he suddenly plummets to the water, hits with a mighty splash, and snags his fish.

Although the bird is a fast diver, he is a slow swallower, a weakness exploited by the sea gulls. Often a single pelican will be closely followed by two or three gulls, competing with each other to snatch the big bird's meal from his long beak before he can manage to gulp it down.

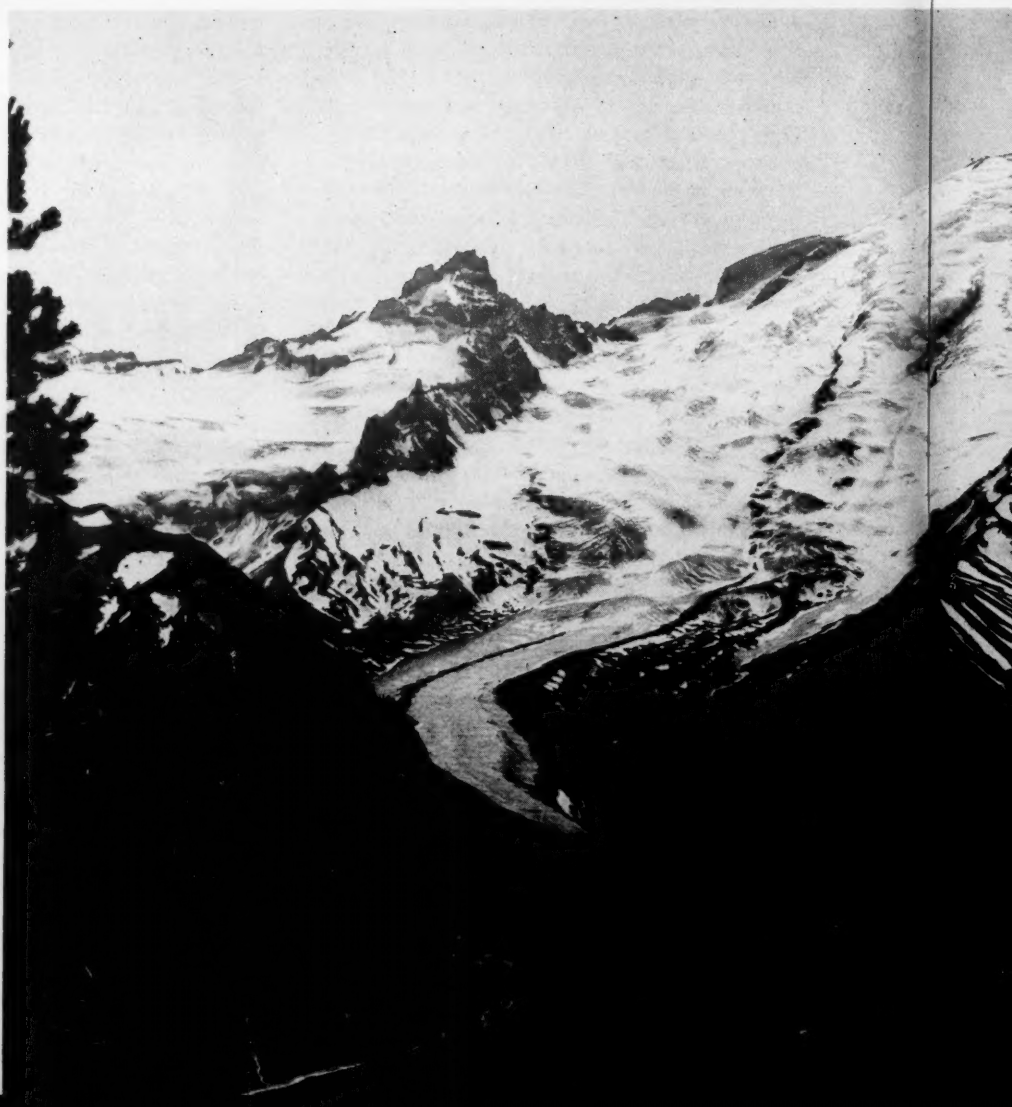
One of the most rewarding sights to be seen over the bay is the visit of a flock of great white pelicans from their homes on the lakes of the Great Basin, east of the Sierra. Unlike the resident brown pelicans, they visit the bay only rarely, usually in the spring or fall. They are among the largest flying birds on earth, with a wingspread sometimes reaching ten feet.

A flight of seventy or eighty may appear off the Embarcadero, soaring high above the surface like a squadron of heavy bombers in line, scarcely moving a wing. They fly with impressive dignity, their long necks curved easily back, yellow bills resting forward, white wings glinting in the sun. Effortlessly they ride the air currents, with no apparent purpose or desire other than sheer enjoyment of the sunshine and the blue bay, unperturbed by the traffic along the shore or the boats below them. Even an occasional low-flying plane leaves them unruffled; they magnificently ignore the noisy mechanical intruder, holding their rightful place with placid dignity. . . .

When the formation changes, however, the entire flock moves apparently at the same instant, as if governed by radio signals. Like many birds, the pelicans possess a cerebellum – the part of the brain governing co-ordination – which is in some ways more highly developed than that of the human being. What communications, imperceptible to humans, pass among them, guiding their maneuvers, is a mystery as yet unpenetrated by science.

In their superb grace and dignity, in the beauty and mystery of their smoothly co-ordinated flight these great birds seem to epitomize and climax the bay's evolving pageant of life. From the most primitive mollusks in the ooze of the bay bottom to these majestic dwellers of the sky, the life of the bay is a single, unfolding drama of creation, a galaxy of societies as varied and complex as the cities on the shores.

PACIFIC CREST TRAIL



Ice-clad Glacier Peak, above, in the state of Washington, is on the route of the 445-mile Cascade Crest Trail section of the Pacific Crest Trail. U. S. Forest Service photo.

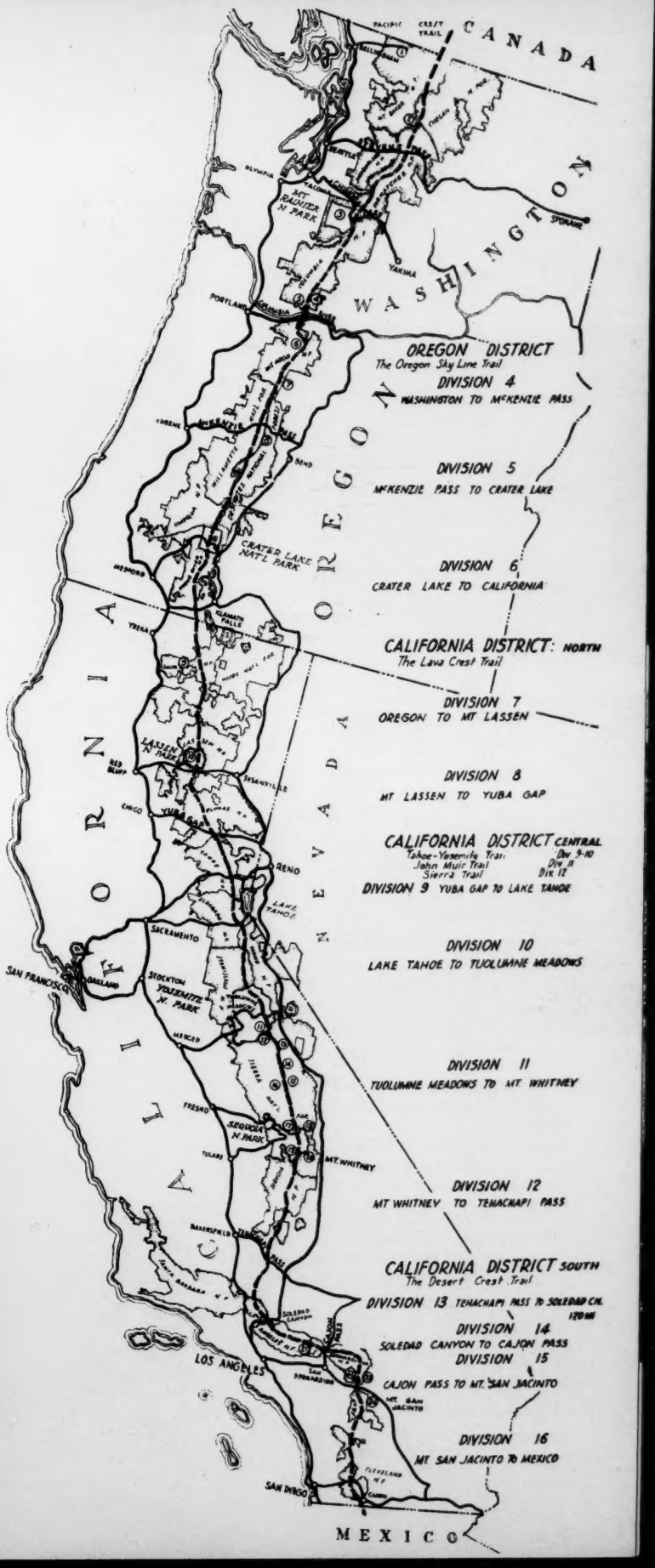
Mount Rainier, at right, and its elaborate glacier system are among the outstanding scenic features along the Pacific Crest Trail. The trail traverses six national parks including Mount Rainier National Park. Photo by the author.

Far right, the 2,200-mile Pacific Crest Trail (dotted line) winds along the mountaintops from the Canadian line to the Mexican border, passing some of the world's most magnificent scenery.

Weldon F. Heald

WEST COAST TWIN to the famous Eastern Appalachian Trail is the Pacific Crest Trail. Although retiring and little known, this spectacular pathway in the wilderness winds for 2,200 miles along the mountaintops from the Canadian line to the Mexican border, and passes through some of the country's grandest scenery.

Along its length are hundreds of miles of vast evergreen forests; soaring glacier-clad peaks; waterfalls and cascading trout streams; chains of emerald lakes; flowery alpine meadows, and far-flung panoramas extending from the tawny deserts of the interior to the blue line of the Pacific. Two great mountain ranges are traversed from end to end — the Cascade and the Sierra Nevada — and in the south the trail follows the lofty rim of Southern California's fabulous coastal valleys, with their fast-growing population of more than five million people. In fact, this remarkable skyline riding and hiking route offers the outdoors enthusiast a rich and varied field for a lifetime of exploration.



The Pacific Crest Trail is the dream-come-true of the late Clinton C. Clark of Pasadena, California. In 1932, Clark proposed to the United States Forest and Park services the project of a continuous wilderness trail from Canada to Mexico, passing through the states of Washington, Oregon and California. His plan envisioned a pathway along the summit divides of the mountain ranges of these states, traversing the best scenic areas and maintaining an unspoiled primitive character. The idea was enthusiastically approved and adopted, and in 1937 the trail became a reality. But there is still much work to be done and, in many places, it is simply a rough "way through," not conditioned for saddle and pack animals.

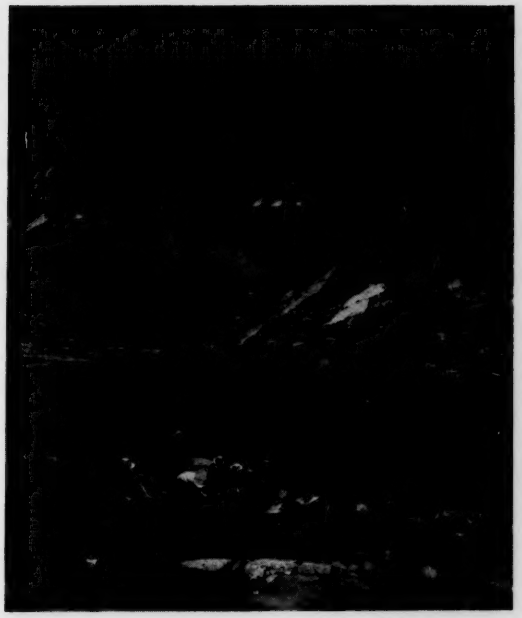
Today, the Pacific Crest Trail is completely mapped, routed and signed. It passes through twenty-two national forests, nineteen Forest Service wild and wilderness areas, six national parks and several state parks. Thirteen of the Pacific Coast's fourteen 14,000-foot peaks lie along the route, and eight of the giant dormant snowcapped volcanoes of the Cascade Range are passed. The trail borders more than 1,000 lakes, crosses fifty-seven mountain passes, and it varies in altitude from near sea level to 13,200 feet in California's Sierra Nevada.

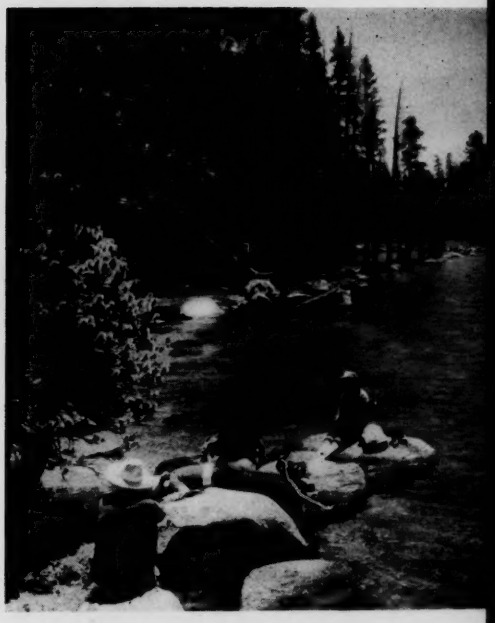
The Pacific Crest Trail consists of seven sections. Starting at the Canadian boundary, the Cascade Crest Trail follows close to the divide of the Cascade Range through some of America's wildest mountain country, passing Glacier Peak, Mount Rainier National Park, and Mount Adams to the Columbia River. In this northern section of 445 miles is the country's most spectacular alpine area, with probably three times as many glaciers as in the remainder of the United States.

Southward for the next 442 miles comes the

Above, three lofty peaks meet the eyes of travelers along the Oregon Skyline Trail section. At top is Mount Hood; middle, Mount Washington, and Mount Jefferson is at the bottom.
U. S. Forest Service photos.

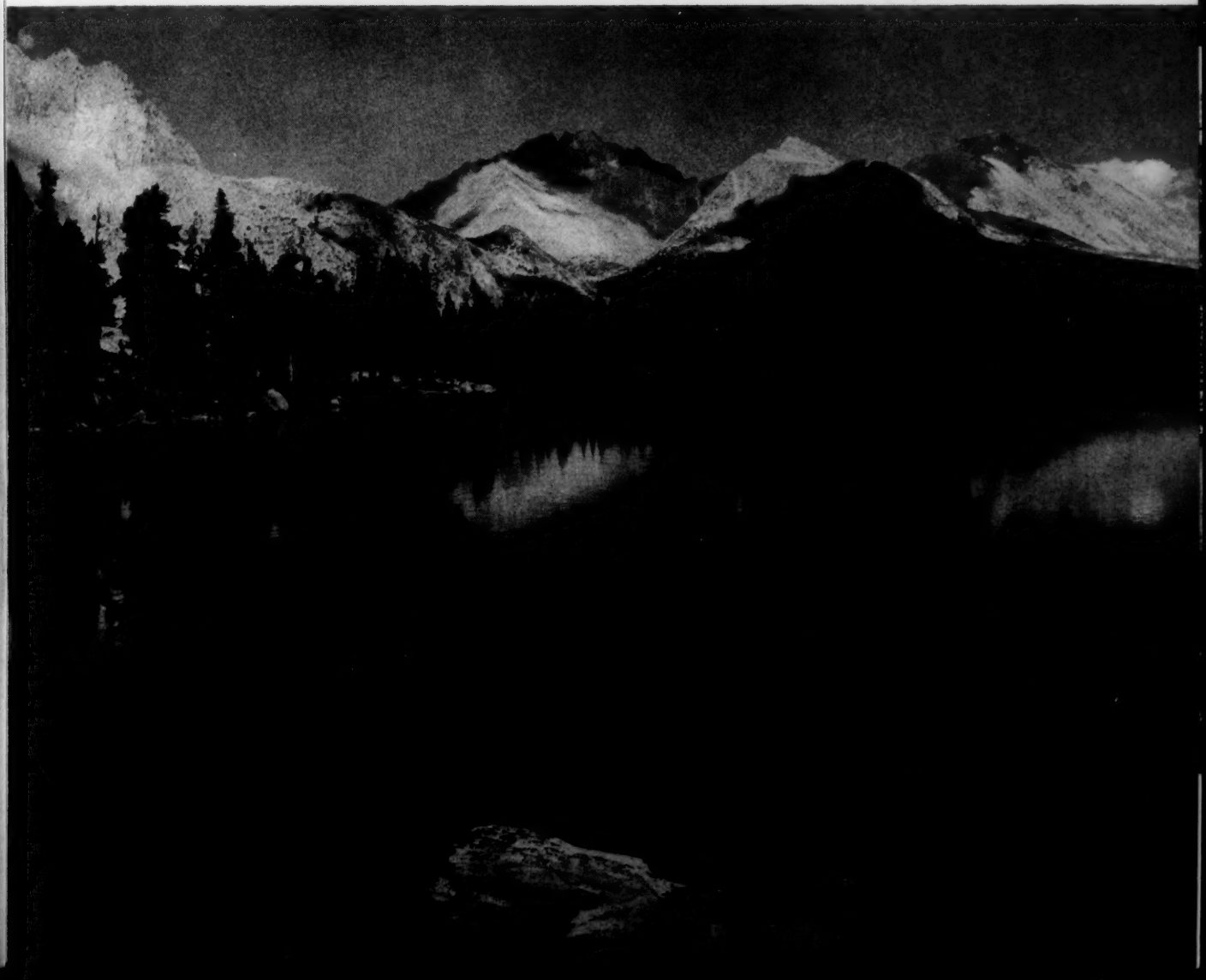
Right, a pack train crosses 12,000-foot Muir Pass in California's Sierra Nevada in the Kings Canyon National Park area. Photo by the author.





Pack trip party lunching beside a lake in Kings Canyon National Park on California's John Muir Trail. Right, a party resting at another of the 1,000 lakes along the Pacific Crest Trail. Photos by the author.

Prosaically named but beautifully "landscaped," Bench Lake, below, is along the John Muir Trail in Kings Canyon National Park. Photo by the author.



The Pacific Crest Trail follows the lofty backbone of California's Sierra Nevada range from end to end. Below is Mount Brewer as seen from Mount Gould. Photo by the author.

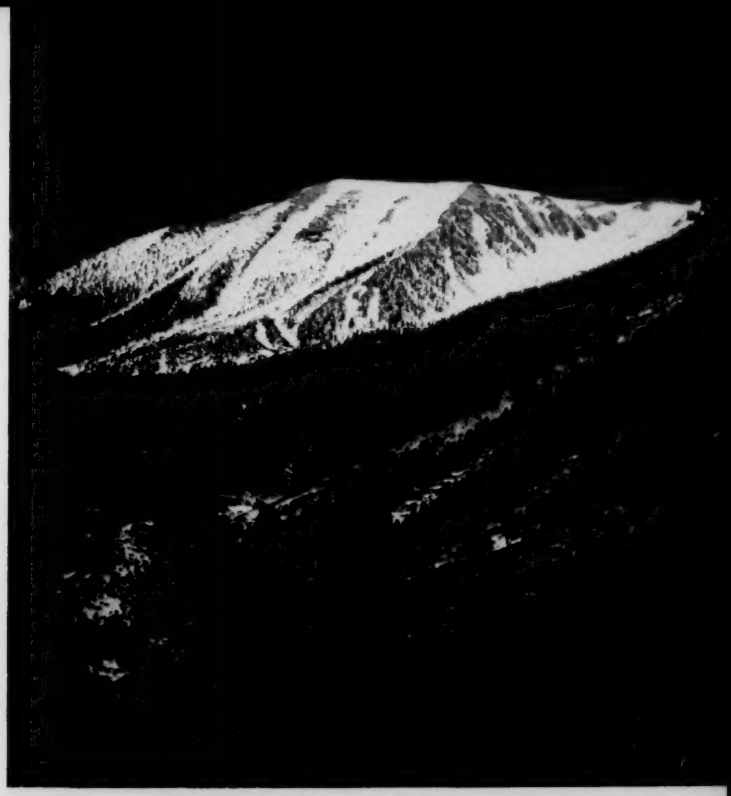
well-known Oregon Skyline Trail which keeps to the broad, mile-high top of the Cascades, by superb Mount Hood, Mount Jefferson, the Three Sisters, and Crater Lake National Park, to the California line. There, the 339-mile Lava Crest Trail continues, via stately Mount Shasta and Lassen Volcanic National Park, to Yuba Pass in the northern Sierra Nevada.

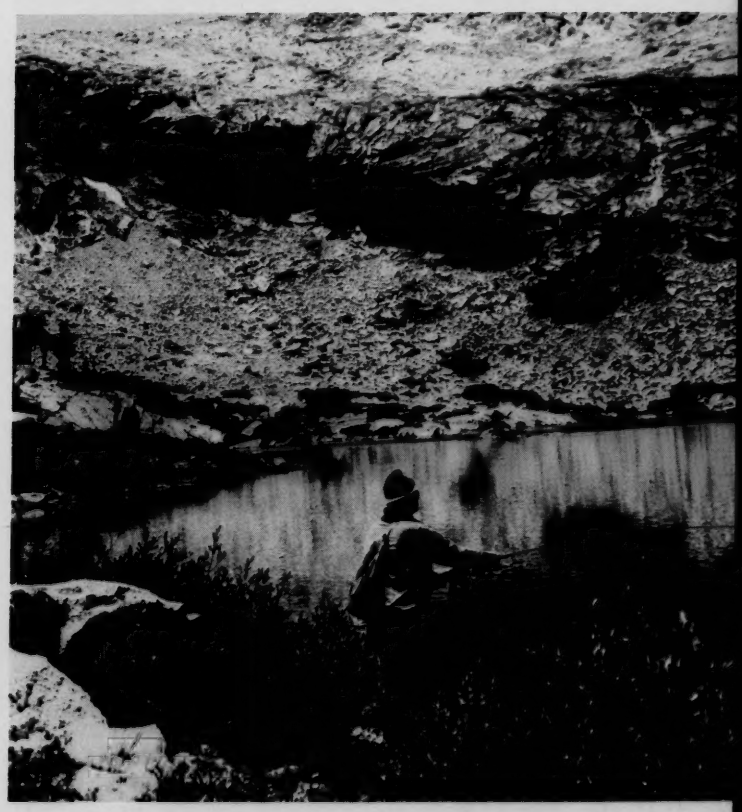
The Tahoe-Yosemite Trail, 249 miles long; the justly famed, 185-mile John Muir Trail through the High Sierra, from Yosemite National Park to Kings Canyon and Sequoia national parks; and the Sierra Trail, 137 miles, to Tehachapi Pass, traverse the entire ridgepole of the gigantic Sierra Nevada. The final southernmost section is called the Desert Crest Trail, and crosses the Mojave Desert and climbs the mountain divides south to the Mexican border, 406 miles.

Details about specific sections and local trail conditions are furnished upon request by supervisors' headquarters of the several national forests and by supervisors of the national parks along the

route. A thorough *Guide to the John Muir Trail* is published by the Sierra Club.

This unique pathway in the sky provides a nearby, easily reached escape to the wilderness for West Coast outdoors people and nature lovers. The Pacific Crest Trail is a part of our natural heritage fortunately preserved for us, and we should jealously guard it against the encroachments of roads, resorts and commercial developments. For future Americans will need this touch of the original wilderness even more than we do.





Top, the Desert Crest Trail segment of the Pacific Crest Trail reaches the top of Southern California's highest mountain, San Gorgonio Peak. Bottom, a fisherman tries his luck in Colby Lake, one of the good fishing spots to be found from one end of the Pacific Crest Trail to the other. Photos by the author.

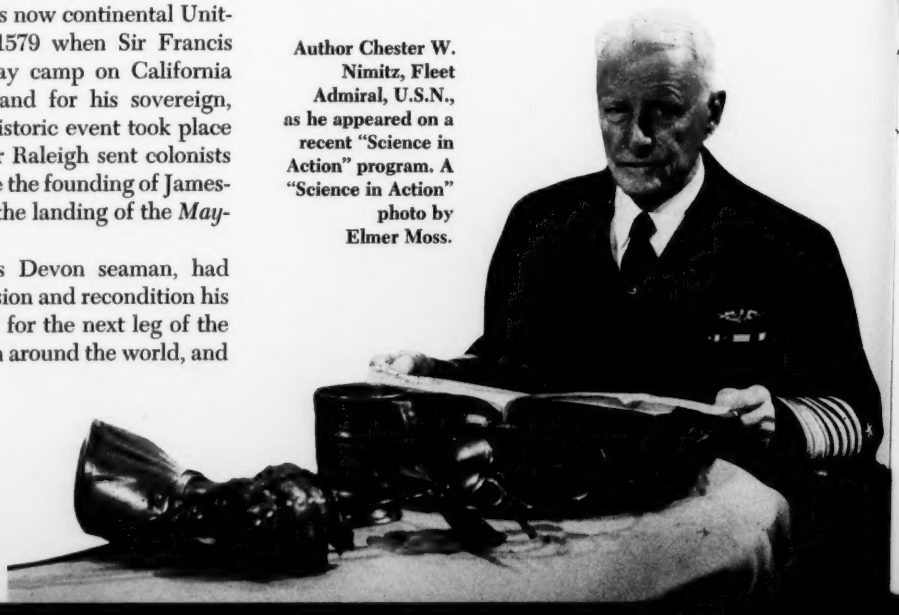
Drake's Cove

WITH ALL OF THE recent fanfare given to the voyage of the *Mayflower II* and to the 350th anniversary of the founding of Jamestown, it is only right that Californians should take pride in remembering that the first actual contact between England and what is now continental United States took place in 1579 when Sir Francis Drake established a 36-day camp on California shores and claimed the land for his sovereign, Queen Elizabeth I. This historic event took place six years before Sir Walter Raleigh sent colonists to Roanoke, 28 years before the founding of Jamestown, and 41 years before the landing of the *Mayflower I*.

Drake, the adventurous Devon seaman, had found it necessary to provision and recondition his flagship, the *Golden Hind*, for the next leg of the voyage that was to take him around the world, and so, on June 17, 1579, he sailed into a port at latitude 38° on the California coast, put up a plate of brass which named the land Nova Albion, and claimed the territory for Queen Elizabeth.

Discovery of this "Plate of Brasse," subsequently authenticated by Professors Colin G. Fink and E. P. Polushkin at Columbia University and now on view in the Bancroft Library at the University of California in Berkeley, has given us the oldest extant relic of British-American relations. However, the plate's discovery did not conclusively pinpoint a site that can be commemorated as a national monument in the same manner as Jamestown or Plymouth Rock. Realizing this, the Drake Navigators Guild was founded in 1949 and incorporated in 1954 as a non-profit California corporation to analyze documentation on the subject of Drake in California, to conduct field exploration and to make such studies as might lead to the identification of the site of Drake's careenage and encampment, and to stimulate public interest in historical areas and artifacts for the preservation of the rich historical and maritime tradition of Drake in California.

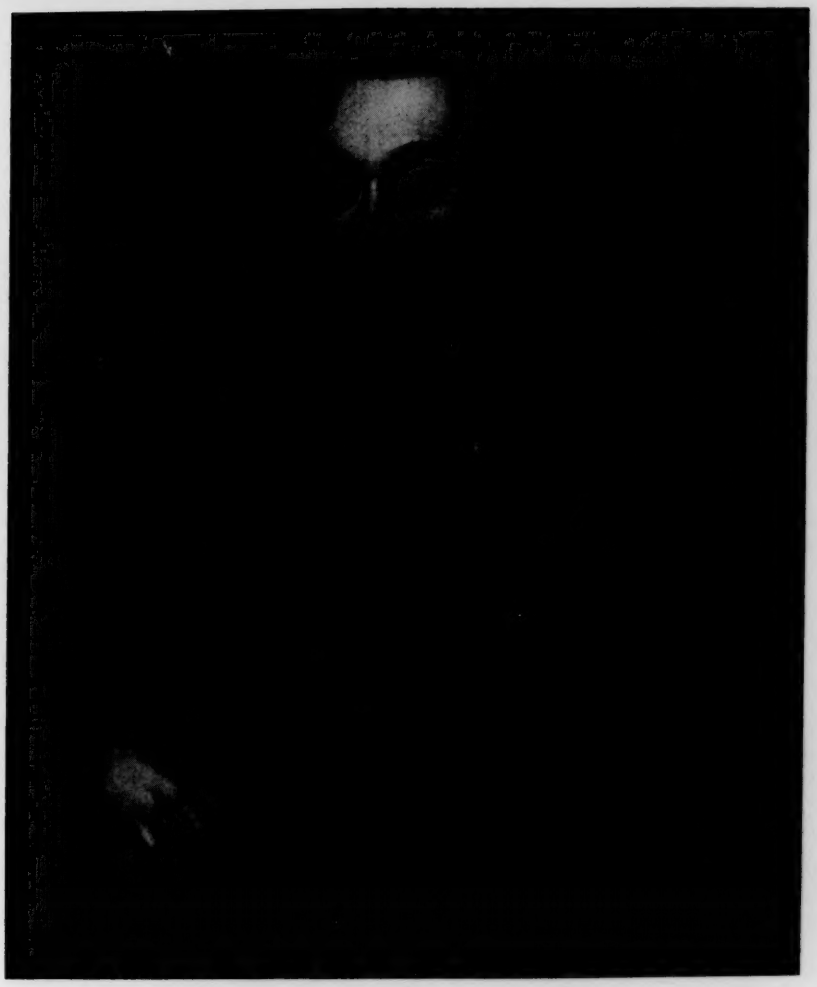
The earlier efforts of anthropologists, archeologists, historians, lawyers, amateurs, and professionals with widely varying degrees of information and misinformation on the documentary material and local terrain, to identify Drake's anchorage, were carefully studied. The Navigators Guild elected to continue the work of Dr. George Davidson, an early president of the California Academy of Sciences, who approached the problem as a navigator and cartographer. Drake had arrived



Author Chester W. Nimitz, Fleet Admiral, U.S.N., as he appeared on a recent "Science in Action" program. A "Science in Action" photo by Elmer Moss.

A model of the famous *Golden Hind*, above, which is on display in Buckland Abbey, the museum maintained in Sir Francis Drake's former home near Plymouth, England. All photos in this article except that of Admiral Nimitz are courtesy of Drake Navigators Guild.

A NAVIGATIONAL APPROACH TO IDENTIFICATION



Four years ago—in 1954—Pacific Discovery carried an article entitled* Portus Novae Albionis Rediscovered? *by Robert H. Power in which the author presented his case for northern San Francisco Bay as Drake's California landing place. The article on these pages, on the other hand, gives Drakes Bay the nod.

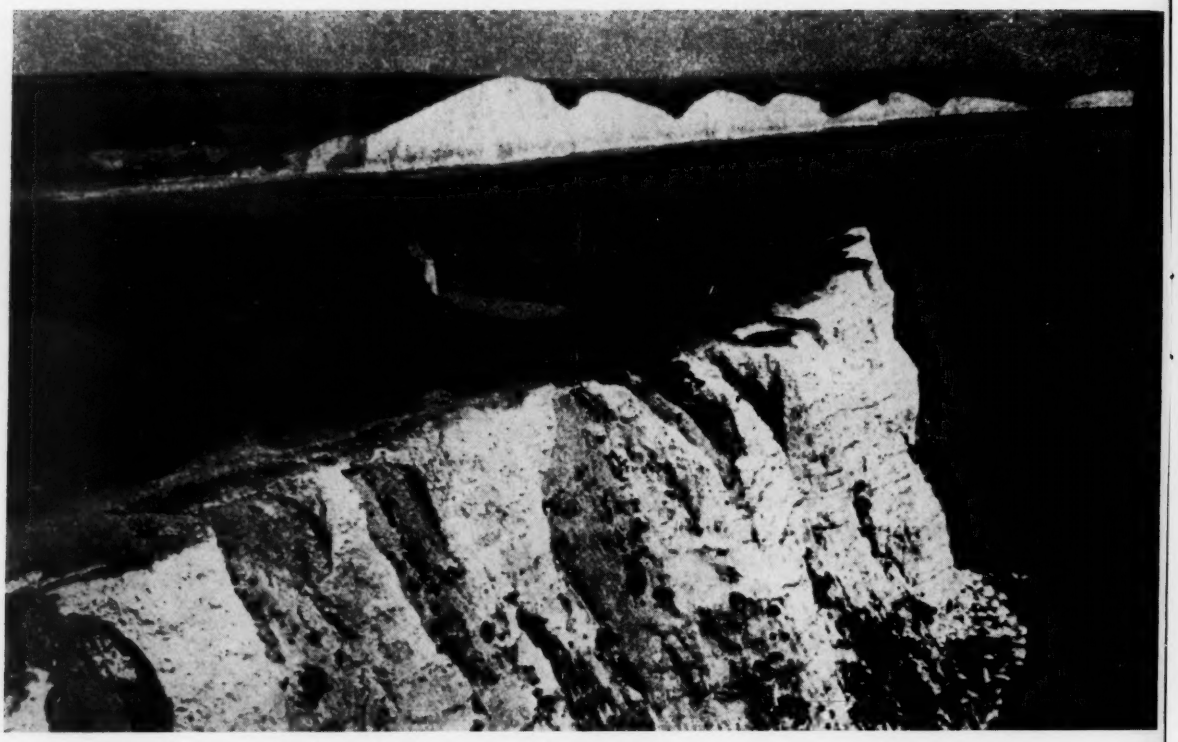
CHESTER W. NIMITZ

by sea and he had departed by sea, and seagoing procedures being less subject to changes over the centuries than are land, what could be more logical than to use the mariner's approach? What Drake observed as he approached the land, others, centuries later, would also find. Indeed, sailors today look upon landfalls, courses and distances, weather, victualling, maintenance of vessel, and accuracy of navigation in much the same manner as they did in Drake's day. The real changes wrought by time have been in means of propulsion, more accurate charts, aids to navigation, radar and other electronic devices, and comfortable dry docks. Remove these and you will find today's sailor as resourceful as the seaman of the 16th century, and those imbued with a love for the sea can project themselves into the limitations of earlier centuries because of experience and an innate knowledge of the sea.

Further justification for continuing the navigational approach to the Drake problem was derived from the Guild's examination of the Roanoke Colony studies provided by H. C. Harrington of the National Park Service. Archeologists had determined that none of the few artifacts found through excavation could be identified positively as of English origin, although the colonists had gone to Roanoke five years after Drake's voyage and had lived there for three years. The Guild recognized that a 36-day encampment such as Drake's in California would present a problem even less fruitful archeologically. Artifacts, being portable, can be left on one site and found on another.

Having plotted their course by the ways of the sea, the Guild proceeded to assemble all available facts. This involved an exhaustive study of original maps, charts, and early documentation. The data were then sifted to establish coördinates which, when found to converge at a common point, must pinpoint the location of the careenage. It was

Sir Francis Drake, above, in a portrait by M. Gheeraerts, Dutch portraitist. Drake sat for the portrait in the late 16th century in London.



as simple as that – a direct, navigational approach to the basic problem, but one which entailed over seven years of intensive research and detailed investigation to substantiate each step of the solution.

In practical navigation, the two coördinates of latitude and longitude are usually considered adequate to establish location, though any sailor would be grateful for such added information as weather, soundings, currents, and land formation to aid in reaching an unfamiliar destination.

Documentation gave the Guild only one primary coördinate of navigation – latitude 38° on the California coast, a dependable figure because Drake's accuracy as to latitude has been proved acceptable with a minimum margin of error.

Latitude 38° leads us to a portion of Drakes Bay or a portion of inner San Francisco Bay around Point San Quentin. Accurate determinations of longitude had still to wait for the availability of accurate chronometers. The Guild had thus to look for additional coöordinates of weather conditions, distinguishing landmarks, channel depths, and other physical conformation data to supply circumstantial coöordinates that could be accepted in place of longitude, the missing primary coördinate.

The Guild found that latitude 38° could be trued by both weather conditions and an important landmark. To agree with 16th century documentation, the site must lie in an area subject to prevailing fogs during the summer months to support the statement that ". . . neither could we at any time, in whole fourteene dayes together, find the aire so cleare as to be able to take the height of Sunne or starre . . ." This is not now, nor is it likely that it ever was, a condition typical of San Francisco Bay or Point San Quentin. It is, however, the seasonal condition in the Drakes Bay area. Furthermore, the site should be trued with the landmark reported by Hakluyt when he wrote: "Our Generall called this Countrey, *Nova Albion,* and that for two causes: the one in respect of the white bankes and cliffes, which lie towards the sea: and the other, because it might have some affinitie with our Countrey in name which sometime was so called." "White bankes and cliffes" are characteristic of Drakes Bay and are completely missing from the area around Point San Quentin.

We now have latitude 38°, evidence of prevail-

Above, the "Seven Sisters," white cliffs on the Sussex seacoast in England. At right, similar formations at Drakes Bay. Hakluyt, a lieutenant of Sir Francis Drake, wrote: "Our Generall called this Countrey, *Nova Albion,* and that for two causes: the one in respect of the white bankes and cliffes, which lie toward the sea . . ." Members of the Drake Navigators Guild believe the white cliffs Drake meant are these on the sea near the Drakes Bay entrance.

ing weather conditions, and the stipulation of "white cliffs," all converging in the region of Drakes Bay. Furthermore, the designation of cliffs "which lie toward the sea" suggests an inner harbor. The area of search was narrowed further although a specific location could not be accepted without further agreement of 16th century documentation with 20th century physical fact.

From a mariner's standpoint, a prime consideration of any landing is its suitability for the purpose involved. On this tack, the Guild discerned the important fact that Drake, the most competent seaman of his time, cruised by a considerable portion of this coast before putting ashore and that the determining factor in his choice of landing was that it should be a proper careenage or place to lay the vessel on its side to repair rotten planks, bream its bottom, and make it seaworthy for the impending voyage across the Pacific and around to England with the treasure that was to rejuvenate the British nation. Furthermore, the chosen site must have as much privacy and freedom from observation as possible. Drake was ever mindful of the lives and well-being of his men, and neither men nor treasure could be brought home safely without most careful consideration of the condition of his vessel and the refreshment of his men.

The Guild therefore studied records of careenage throughout the world. They analyzed the essential requirements for careenage. Studies of the records of Drake's own careenages made it apparent that he required a protected inner harbor similar to that of Port San Julian and Port Desire on the eastern coast of South America, both of which he used and commended as "safe" and "fit" harbors prior to his careenage in California.

Help from various sources, including Professor Alexander at the University of California, was sought for the exact 16th century usage of the word *"Portus,"* the descriptive term in contemporary accounts which designates Drake's California landing place – *Portus Novae Albionis* – and, as also applied to *Portus Javae Majoris,* used, as it had been since Roman times, to denote a protected inner harbor within a river or estuary, near its mouth. This furnished another coördinate to determine the position of the site.

The Guild also had to seek a "Waterway entrance into the sea" where conditions of shore, bottom, tides, and shelter would be favorable to the

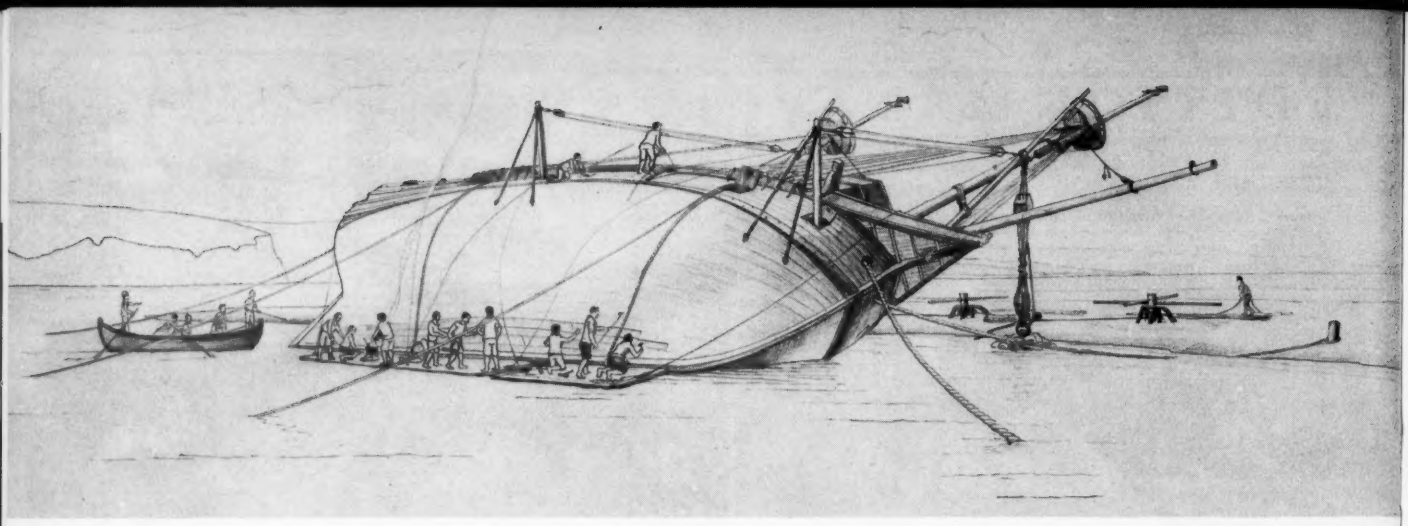
THE FAMOUS Hondius Broadside, which shows the world and the routes Sir Francis Drake sailed around it, as seen by the Dutch cartographer, Jodocus Hondius, in the late 16th century.

(Separate copies of the Hondius Broadside —printed on antique-finish paper and this same size—are available at the Academy or from the Drake Navigators Guild.)

EXPEDITIONIS NAVTICÆ

n solvens 13 Decembris anno 1577. terrarum orbis ambitum circumnavigans, unica tantum navi, ingenti cum gloria,
t 27 Septembris 1580. ADDITA *est etiam viva delineatio navigationis Thomæ Caundishi nobilis*
r universum orbem; sed minori damno & temporis spacio: vigesimo-primo enim Julij 1586 navem conscendit, & decimo
ndè prius exierat, magnis divitijs & cum omnium admiratione reversus est. Iudocus Hondius.

DIEV ET MON DROIT



Above, a recent drawing of the careening of the *Golden Hind*. Drawn by Warren Chase Merritt.

Right, the *Portus Novae Albionis* inset from the Hondius Broadside. Below are two aerial photographs of the entrance to Drakes Estero taken by the Department of Agriculture. In the photograph on the left, taken in 1943, the long sand spit resembles the formation in the Hondius inset. The photograph on the right was taken in 1952 and indicates how the sand formations at the Estero are constantly changing. The Drake Navigators Guild believes the inset depicts this entrance to the Estero as the formations were in 1579, the year Drake landed in California.

procedure of careening or graving a vessel the size of the *Golden Hind*. The entrance had to be within the Drakes Bay area already suggested by latitude, seasonal fog, and distinguishing white cliff landmarks.

Professor Davidson, in his research, found in Munich a most important early map of the Pacific Coast which shows a half circle harbor similar to Drakes Bay with a little feathery lead-off suggesting a river at about its center. It is interesting that the designation of this port is inscribed, not on the seaward but on the land side, as "Il Porto Bonissimo," a variation of "portus" – literally "the best of ports."

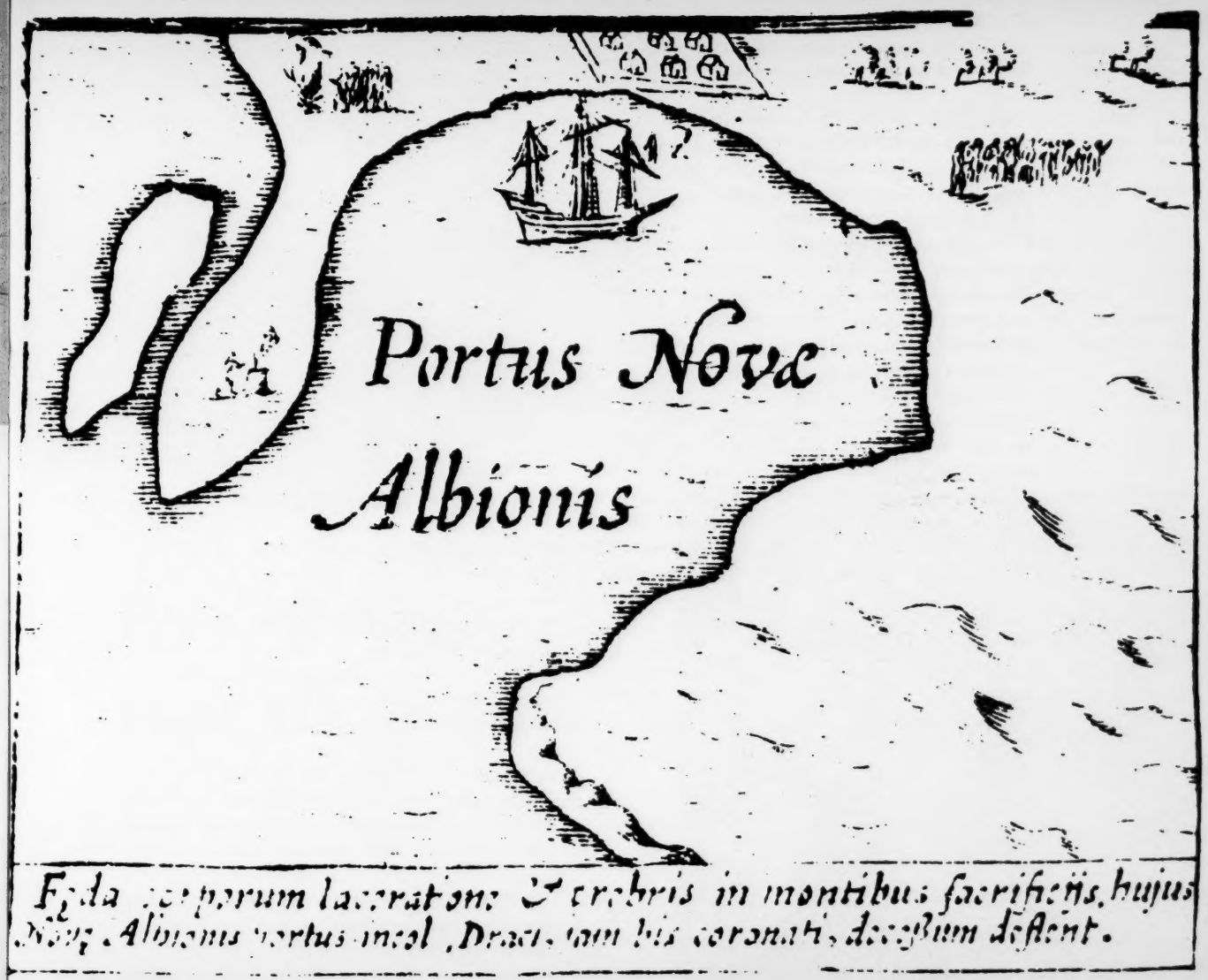
No actual "river" flows into the arc of Drakes Bay, but the mouth of Drakes Estero, where five lagoons enter the Bay through a narrow common channel, does present similar conditions which led the Guild to center its investigation and exploration in that immediate area.

We know that when Cermeno wrecked his vessel off the entrance to the Estero in 1595, subsequent to Drakes visit, he took soundings of the channel. He recorded it as having three fathoms or eighteen feet of water over the bar. Soundings taken in 1951 showed little difference in the channel depth.

Drake's vessel drew approximately 13 feet when fully laden and as little as 7 or 8 feet when lightened preparatory to careening. To Drake, who was accustomed to the typically small inner harbors of the 16th century, the problem of negotiating the Estero entrance was relatively simple. This entrance is more than one hundred yards wide.

One of the most important documents with which the Guild worked was the *Hondius Broadside*, published by Jodocus Hondius prior to 1593. This is a chart showing Drake's circumnavigation of the globe with three insets showing places he visited. These insets are reasonably detailed views of specific areas, and one has been identified as being in the Moluccas, and another as the modern port of Tjilatjap, Java. Both correlate closely with modern hydrographic charts, and thus indicate the relative accuracy of the insets of the *Hondius Broadside*.

The third border inset is marked *Portus Novae Albionis* – the California careenage site. This inset has baffled historians in the past because it has never been satisfactorily identified with any bay or inlet on this coast. However, after establishing the correlation of the Molucca and Tjilatjap insets with modern hydrographic charts, the Guild recognized that it was reasonable to expect that the *Portus Novae Albionis* inset must be closely identifiable with an existing conformation. If *Portus Novae Albionis* could be identified with a protected inner harbor – of the size used in the 16th century – at the mouth of the Estero, there could no longer be any doubt of Drake's careenage.



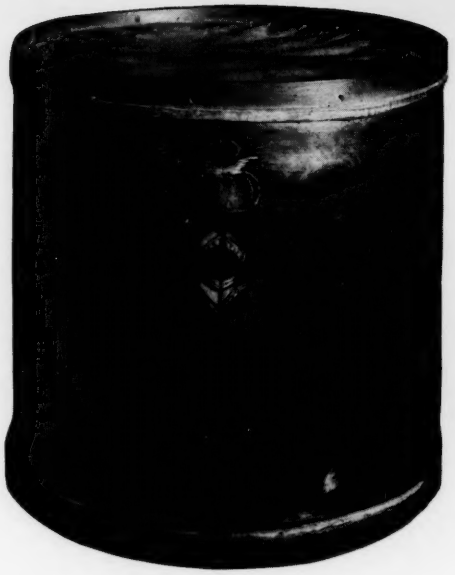
Fida corporum lacerationis & crebris in montibus sacrificiis, hujus Novæ Albionis portus incol. Draconum his coronati, deorsum desiunt.

Below, Sir Francis Drake captured in metal. The statue is at Plymouth, England where Drake began his voyage around the world.

Many field trips to the mouth of Drake Estero were made by Guild members. The adjacent area was explored intensively. Extensive excavation of 16th century Indian sites was carried on and careful photographic records were kept.

Finally, the key to the solution appeared in a photograph which showed at the entrance to the Estero a spatulate shaped sandspit with an adjacent sand island which resembled the characteristic barrier formation of the *Portus Novae Albionis* chart that had so long confused historians and evaded specific identification! This photographic clue was confirmed by a strict correlation of the Hondius inset terrain with all its indicated physical features, including hills and bluffs. This led to studies of the cycles of change in sand formations at the mouth of the Estero due to established hydraulic forces. Excellent help was given the Guild by the U. S. Coast and Geodetic Survey whose Washington office compiled tidal data for the summer of 1579, and important maps and aerial photographs were supplied by the U. S. Army Engineers, U. S. Coast Guard, and U. S. Department of Agriculture.

Confirmation of the theory that the Estero entrance periodically reproduces its appearance of 1579 was strikingly revealed during the winter of 1953. The Guild had conclusive evidence that the Hondius inset of *Portus Novae Albionis* is a true representation of a portion of the westerly shore of Drakes Estero near its entrance into Drakes Bay as it appeared in Drake's time, and as it has appeared periodically in the intervening centuries.



Guild research revealed that conditions favorable to the purpose for which Drake landed in California are satisfied by the character of the cove site thus pinpointed by their seafaring procedure. The existing hard-structure formations together with the periodic shift of sand formations are consistent with the place described by Drake records and charted by Hondius. Also, the surrounding area was well watered and wooded and food supplies were abundant.

In summary, the course charted by Drake Navigators Guild has led to the only site that fully meets all the requirements indicated by the documentary accounts of the voyage.

1. Latitude.
2. Weather conditions.
3. The White Cliffs and the name New England.
4. A protected inner harbor, or *portus,* suitable for careening a ship for repairs and for obtaining provisions.
5. The strict correlation of the cove within the Estero with the *Portus Novae Albionis* both in permanent land formation and changing sand bars and beach.

It is this cove, now known as Drake's Cove, on the western shore of Drake's Estero adjacent to Drakes Bay, that was the site of Drake's careenage and 36-day encampment in 1579.

Sir Francis Drake's drum, above, now on exhibit in Buckland Abbey. The drum, documents indicate, was used in place of a bell for calling Drake's men to formations on board the *Golden Hind*.

An Earwig that Likes Bats

M. W. F. Tweedie

IN 1909, a curious insect genus was described from specimens obtained from the bodies of Naked Bats (*Cheiromeles torquatus*) collected in Borneo. The genus is *Arixenia* and it was assigned to the order *Dermaptera*, which comprises the earwigs.

Two species of the genus are now known; the original one, *Arixenia esau*, and *A. jacobsoni*, found in Java. Both species have since been found in Malaya in a hollow tree in which Naked Bats were roosting. The insects' association with this bat seems definitely established, but they appear not to be true parasites.

In the great cave at Niah in Sarawak, *A. esau* is

present in large numbers but is only found in an area in which the roof is a roosting place of *Cheiromeles*. And in this area, and this area only, the bodies of young Naked Bats are scattered in quantity on the floor of the cave.

The *Arixenia* are present running about on the bat and Swiftlet (*Collocalia*) guano on the floor and they are also to be seen on the dead bats. (See photos) The greatest concentration, however, is on a large timber brought into the cave for scaffolding by collectors of the edible nests of the *Collocalia*. The *Arixenia* are always accompanied by numbers of beetles of the family Tenebrionidae and by a species of Pseudoscorpion.

bbey.
alling
Hind.

They Put SNAKES To Work For Mankind

PERHAPS IT IS no accident that snake charmers have chosen the cobra as the symbol of their profession. The cobra has a deserved reputation as one of Asia's deadliest snakes and handling such a potent creature is, indeed, an act of high courage.

Cobra poisoning is quite common in most Asian countries and its treatment is a prime medical problem. Many lives are claimed by the cobra each year largely because the victims of a cobra bite are too far from centers where medical treatment is available.

One Asian nation, Thailand, with one of southeast Asia's highest incidences of snakebite poisoning, has launched an effective program to reduce this menace. Central Thailand, which includes the area contiguous to Bangkok, is a lowland region that, at certain seasons, is literally infested with deadly venomous snakes. Chief among these are the king cobra, which frequents the jungle regions, and the common cobra, which ranges the rice fields during the harvest in search of rodents, its favorite food.

Practical steps to cut down the death rate from snakebite poisoning are being taken at the Pasteur Institute in Bangkok. The Institute, officially named the Queen Saovabha Memorial Institute, and now an affiliate of the Thai Red Cross, maintains a serpentarium, or snake farm, as the public has come to call it. Here, trained attendants extract venom from cobras and other highly venomous snakes, venom that is used for the manufacture

Above, a tangled mass of banded kraits in one of the Pasteur Institute serpentarium's pools. The krait is one of the snakes whose venom is used for antivenin serum. Left, another of the serpentarium's most numerous residents, the common cobra, takes the sun in the serpentarium yard. Photos by Don Greame Kelley.

of antivenin serum used in the treatment of snakebite. The Institute keeps eleven species of venomous snakes in the serpentarium, six designated as deadly venomous and five as mildly venomous, all of them quite common in Thailand.

The deadly venomous species are the king cobra, the common cobra, Russell's viper, the banded krait, *Anchistrodon rhodostoma* (a pit viper) and a species of sea snake. The latter snake lives in salt water and is a problem all along the southern coastal area of the country. The green pit viper is the serpentarium's chief inhabitant among the mildly venomous species.

The serpentarium has gained such favor as a public attraction, as well as a source of antivenin serum, two weekly showings are held for the public each week. At one showing, spectators see the feeding of the snakes, and at the other, the extraction of the venom.

It is indeed an unusual sight to watch the white-uniformed attendants snare the writhing creatures and extract the venom. The attendants are not herpetologists but Thais trained to handle serpents. In the eyes of the younger Bangkok set, the attendants are heroes of the highest order.

Director of the Institute is Dr. Chaloem Puranananda, a personable young man who received his medical training in Thailand and went on to do postgraduate work in the United States and Europe. Dr. Puranananda assigned his assistant, Dr. Sriprapai Phong Aksara, to show this writer around the serpentarium and to arrange for a demonstration of the venom extraction process. Dr. Aksara is a serious, intense young lady who is a doctor of medicine as well as holding a master's degree in bacteriology from the University of Michigan.

Dr. Aksara explained how the Pasteur Institute, originally founded to fight rabies (thus the name by which it is popularly known), got into the snake venom business. In its early years, from its founding in 1913 to 1925, the Institute was concerned solely with giving prophylactic treatment for the bites of dogs which might prove rabid.

"While rabies control remains one of the Institute's chief concerns," Dr. Aksara said, "vaccine and serum research are now its major activities."

In 1925, the Institute decided to undertake the control and treatment of snakebite. A serpentarium was added in order to provide a source of venom for the production of antivenin sera, whereupon the Institute found itself rather inelegantly dubbed the "snake farm." Today, vaccines and sera are produced not only for snakebite and rabies but for cholera, typhoid and diphtheria as well. In addition BCG is produced to combat tuberculosis.

The vaccine service produces three types of vaccine of various origins: bacterial origin, for the treatment of typhoid, cholera, plague and autogenus vaccine; viral origin, for the treatment of rabies and smallpox; and toxic origin, for the treatment of diphtheria and tetanus.

Snakes are generally divided into three broad

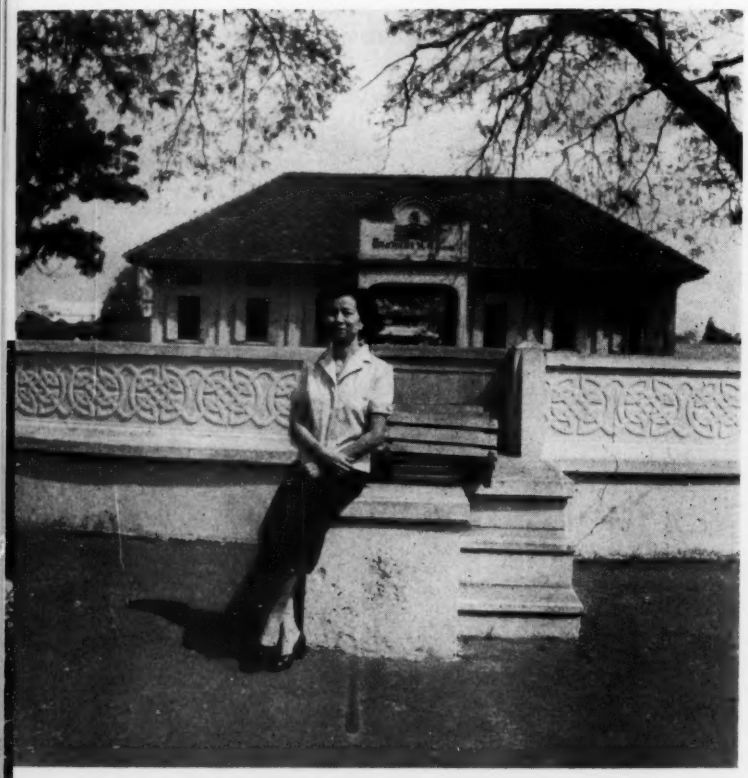
Attendant with deadly king cobras, another of the serpentarium's venom-supplying snakes. The upturned "egg-shells" serve as houses for the snakes. Photo by the author.

groups: deadly venomous, mildly venomous and non-venomous. For its own convenience, the Institute separates the reptiles into two groups, vipers and cobras, according to the action of the snake's venom.

Usually viper venom is largely hemotoxic in character. It acts on the red cells in the blood and destroys the thin epithelial cells lining the capillary blood vessels. Viper venom is a coagulant for blood plasma as well as a hemolytic agent for red blood cells. A direct viper bite into the blood stream causes death by intravascular clotting.

Cobra venom is neurotoxic. It acts principally on the nervous system but it also destroys red blood corpuscles and retards coagulation of the blood. All snake venoms hemolyze red blood cells in varying degrees but cobra venom also has devastating effect on the central nervous system causing death from respiratory and heart failures.

The bites of mildly venomous snakes cause pain and swelling at the seat of the bite and if not treated properly, may become gangrenous. Non-venomous snakes are relatively harmless. They have no venom or fangs and the bite inflicted by the teeth may vary from a slight scratch to a lacerated wound. Venomous snakes also may inflict a scratch or wound but, in addition, they are equipped with fangs through which their venom is carried directly into the punctures.



The author's attractive guide, Dr. Sriprapai Phong Aksara, one of the persons in charge of the antivenin serum program. Photo by the author.

The process of making snake venom into serum is rather involved. After the venom is extracted from the snake it is dried into a crystal-like substance. The crystals are then pulverized and dissolved in a normal saline solution. Later, this saline solution is injected into live horses. Blood is then drawn from the injected animals and allowed to clot. When the blood clots, a residue is left which yields the serum – loaded with antibodies – which is used in the treatment of snakebite.

The amount of serum the Institute produces is sufficient not only to supply the outpatient dispensary but to stock the hospitals of the nation and also to enable the Ministry of Public Health to stock some 200 health centers in outlying portions of the country with the serum.

Most of the antivenin serum the Institute produces is sold to the government and distributed through the Ministry of Public Health, but the Institute is free to supply serum to any and all agencies, medical and non-medical, and it also fills requests from foreign countries. Great Britain, surprisingly enough, is one of the nations which imports a sizeable quantity of the antivenins. In that country, they are used as safeguards to combat the effects of bites from tropical snakes which "stow away" in ships' cargoes.

The Institute's serpentarium is open to the public every day of the year. On Mondays, public demonstrations of the feeding of the snakes are offered and on Thursdays, visitors may see the venom extracted from the reptiles. Commercial tours, as well as individual spectators, visit the Institute on those days and many tourists witness their first such demonstrations.

Bangkok, incidentally, is not the only city in which such demonstrations are staged. São Paulo, Brazil, also has a serpentarium, the Instituto Butantan, of which that city is proud. Here attendants also demonstrate the process of extracting venom from snakes.

The Pasteur Institute in Bangkok will purchase any living snake on sight: the non-venomous varieties serve as food for the king cobras. Venomous or non-venomous, snakes generally do not live too long in captivity. At times, the cobras and banded kraits must be force-fed because they will not eat voluntarily when in capitivity. Since many of the snakes die after a few months in the pits, the snake population must be constantly renewed.

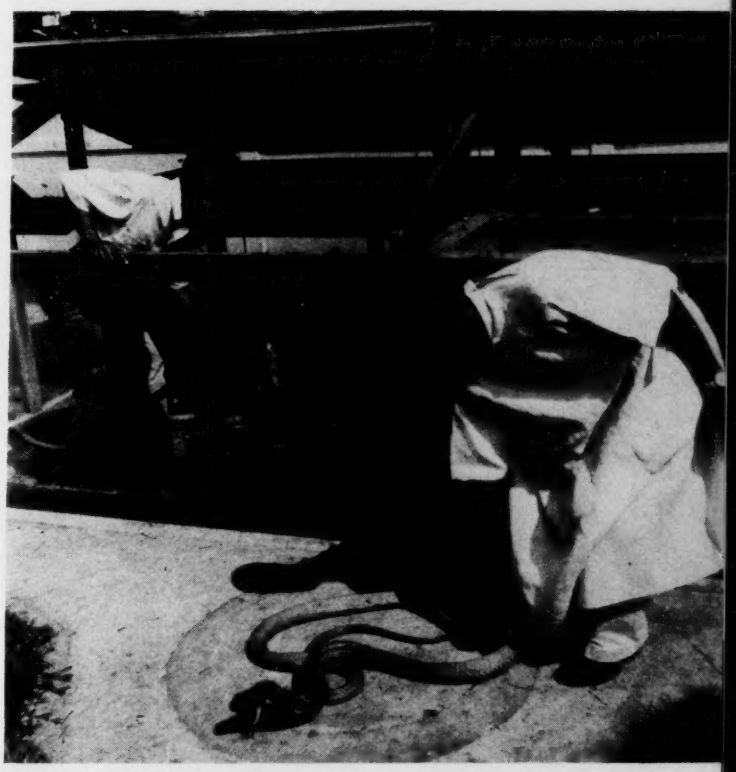
The Institute's standing offer to purchase all snakes offered to it means a population of a thousand or more of the deadly reptiles may be on hand in the serpentarium during the rainy season when the snakes are especially abundant. This assures a steady supply of venom from which to produce the needed antivenin serum.

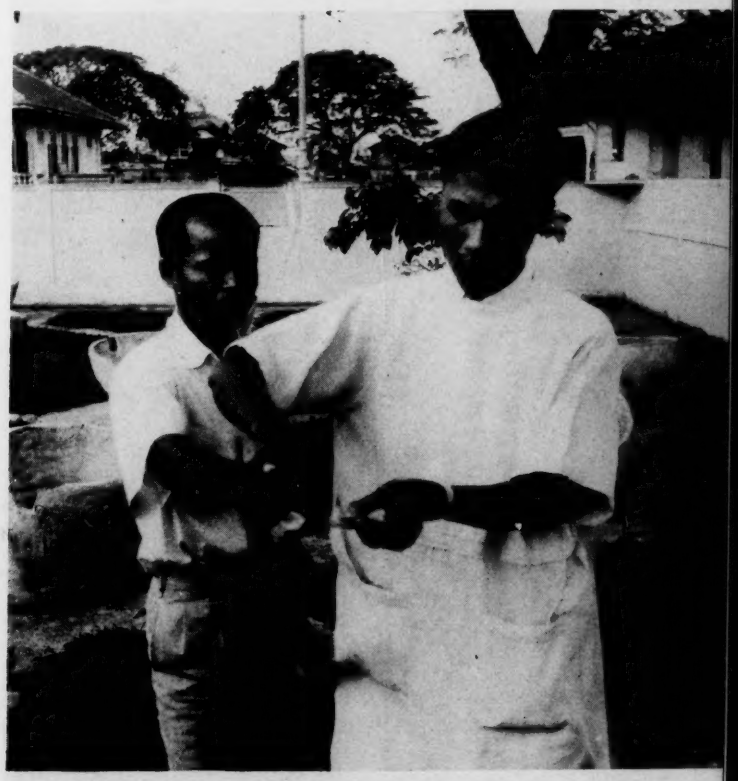
In fact, the Institute's policy of purchasing any and all snakes means not only plenty of venom for antivenin serum but it also supplies excess venom for purposes of experimental research.

The Institute's fine work, of course, cannot stamp out the snakebite menace altogether since it would neither be desirable nor possible to completely rid Thailand of poisonous snakes. But through a thorough campaign of public instruction, a snakebite victim knows the nearest place where he can receive scientific treatment which will greatly increase his chances of recovering from snakebite poisoning.

In one Asian country, thanks to the efforts of the Pasteur Institute, snakes are being put to work for mankind.

Unhappy-looking attendant holding banded kraits. The kraits are nocturnal in habits and are sluggish in the daytime. Photo by the author.





Above, attendants remove cobras from cages preparatory to venom extraction process. Below, the faces of the attendants are grave and their grasp is firm as they extract the venom from a wriggling cobra. Photos by the author.

ROADS TO DISCOVERY

A GREEN ROAD runs from Bangkok to Singapore. It is a winding ribbon of rail and roadmetal which marks a map more sharply than it does the verdant landscape of the Malay Peninsula. Gerald Hawkins says in his book *Malaya,* "All of it is green, green grading from the pellucid shade of young rice or the dull olive of rubber, or the yellowish hue of coconut palms, to the infinite variety of tints in the forest. The land is always green . . ."

This green tongue of land linking two great cities has given me a perspective of both latitude and time on the two crowded weeks of the Ninth Pacific Science Congress which adjourned November 30 in Bangkok. I am grateful for the unhurried trip, by train from the Thai capital to Penang in northwestern Malaya, by car from that Straits settlement all the way down to this one — Singapore; it gave me time to sift impressions of the somewhat confusing conclave.

The first impression of Thailand was softened in a fortnight by acclimatization. Coming in high and cool from Tokyo, one had been reminded at once that Hong Kong boasted a lower latitude. But we stepped out of the crisply comfortable Japan Air Lines DC-6 onto the tarmac of Bangkok Airport into an ambient liquid heat which had, in fact, penetrated the depressurized cabin before wheels touched.

The second impression was happily heightened day by day. The "lost" feeling on landing in a strange country was brushed away in the first few seconds by kind hands and dispelled by friendly faces. Our Thai hosts had met us with a welcome that grew warmer with the progress of the convention, even as the weather appreciably cooled during our stay. Indeed it can be said that the unflagging helpfulness, courtesy, and good humor of these people toward us, their guests, far outweighed the humidity as a conversation piece among Congress delegates. And that spirit moved all ranks, from highest government officers to our young lady guides, bus drivers, and hotel boys. Bangkok went all out for the Ninth Pacific Science Congress: the Thailanders set a high mark for all future Congress hosts.

Far from reflecting on the well-oiled Thai Government management of the Congress, my reference to a degree of confusion concerns only the bewilderment of one delegate confronted with a richer feast of events than he could hope to digest. Not only was Chulalongkorn University packed solid with two weeks of scientific sessions; there was also a wide choice of afternoon and week-end tours to numerous points of interest inside and outside the city of Bangkok, and one could attend some Embassy or private party nearly every evening. Then after adjournment a third week was open for extended grand tours to distant points such as the fabulous northern Thailand city of Chiengmai and its jungled mountains, and to that greatest of ancient monuments in Southeast Asia, Cambodia's Angkor. A

The myriad rooms of Angkor Wat, one of the famous ancient temples in Angkor, boast numerous reliefs of apsaras or sea nymphs such as this example. Photo by the author.

THE EDITOR IN ASIA

Don Greame Kelley

marvelous confusion of wonders, well worth a trip to the other side of the planet!

The larger congress

The question was often asked me, before I left San Francisco, why should a *Pacific* science meeting be held in Bangkok – is Thailand a Pacific nation? A word on the history of the Pacific Science Congresses may answer this. From their inception in 1920 in Honolulu, the hub, these conventions under the aegis of the Pacific Science Association have rotated around three quarters of the rim of the Pacific.*

Conspicuously and regrettably – but it is hoped not permanently – missing from the circle have been the Latin American countries from Mexico to Chile. Vigorously present have been the nations of the farthest western Pacific, those of Southeast Asia, even including Burma and India which the Pacific world can hardly claim on geographical grounds. Naturally the European countries with strong Pacific interests – the United Kingdom, France, The Netherlands – have been well represented; and from as far as Sweden, Germany, and Switzerland have come individual scientists whose interests are in the Pacific. In all, 37 nations were represented by 800 men and women in Bangkok this year.

"What do Pacific Science Congresses discuss?" No better summary could be given in 25 words or less than by part of *PD's* own subtitle, "nature and man in the Pacific World." At this Ninth Congress, while many papers were presented on various aspects of nature – animal and plant classification, geography, evolution – the emphasis, I should say, was markedly on man himself, as the most conspicuous and important form of life above the surface of the Pacific Ocean. Except for opening and closing plenary sessions, the Congress met by divisions and sections: Agriculture; Anthropology and Social Sciences; Botany; Chemistry; Coconut Problems; Conservation; Entomology; Fisheries; Forestry; Geology and Geophysics; Meteorology; Museums; Nutrition; Oceanography; Public Health and Medical Sciences; Soil and Land Classification; Zoology; International Cooperation in Science; Climate, Vegetation and Rational Land Utilization in the Humid Tropics. The divisional titles covered such specialized interests as domestic animal and crop improvement; soils; linguistics; Polynesian origins and dispersals; shifting agriculture; kinship customs within various ethnic groups; rat control; the establishment of a new national museum for Thailand.

The question is perennially raised by some, are these large, costly gatherings worthwhile? If scientists were to travel halfway around the world and back, at great expense to their institutions or governments, merely to present and criticize papers orally, it would be a childish extravagance. If they were to meet solely for the purpose of drafting and acclaiming good resolutions about many things they all agreed it would be extremely beneficial to have accomplished, the money would be better spent getting just one of those things done. Or if they were sent for the purposes of airing national grievances or pressing national claims, it would be a mockery of the spirit of science and denial of the validity of popular trust in scientists as seekers of truth for its own sake and for the general good. It is true that many scientists themselves deplore such conventions as a waste of time and money, and it cannot be denied that they might in some cases be right. In the case of such an international gathering, perhaps only for a minority of delegates could the broadening benefits of travel be cited in justification of attendance – most of them will already have traveled widely in their scientific quests.

If one overriding justification for such conclaves can be found it may be, I think, just this: that the world needs all possible examples of its own proven ability to hold friendly family gatherings, to get together in matters of community interest, to promote the meeting in mutual respect and cordiality with distant cousins, to see how the other half lives and understand its differences. Humanitarian groups (such as the Red Cross) and scientists have led the way to neighboring doorsteps in peace and with respect for differences of custom. Despite childish nationalistic sputtering over sputniks, I have not heard the IGY called a failure. If the nations were to concentrate more on international science congresses and IGYs, they might begin to forget about ICBMs. In his book *Mirror For Man* (which everybody should read) the anthropologist Clyde Kluckhohn shows the way we can and must take, and concludes, in effect, with a "let's get going":

> Human life should remain as a home of many rooms. But the world with all its variousness can still be one in its allegiance to the elementary common purposes shared by all peoples. Those boundaries that block mutual understanding will be worn dim by much international traffic in ideas, in exchange of goods and services. Within each society the use of scientific methods in the study of human relations can adjust our culture patterns to the changes brought about by technology and world-wide economic interdependence. This can happen. It probably will happen. But when?

The quadriennial Pacific Science Congresses are part of the stream of "international traffic in ideas." I went to the Ninth Congress in Bangkok not sure that I would not hear some nationalistic sputterings, such as may be heard currently from Cape Canaveral to the islands west of West Irian. If there were any, I did not hear them. Nor did several others, whom I asked, hear them. Instead, I saw Filipinos sitting down with Japanese in symposia on nutrition and public health; I heard an Indonesian and a Britisher express wholehearted agreement on the necessity of international coöperation in Borneo for the preservation of the

* 1920, Honolulu, Hawaii; 1923, Melbourne, Australia; 1926, Tokyo, Japan; 1929, Batavia and Bandoeng, Java, Indonesia; 1933, Victoria, British Columbia, Canada; 1939, Berkeley, Stanford and San Francisco, California, U.S.A.; 1949, Auckland and Christchurch, New Zealand; 1953, Quezon City, Philippine Islands; 1957, Bangkok, Thailand.

Few structures could so well depict the architectural splendor of a bygone age as this example in Angkor Wat. Photo by the author.

orang-utan and the rhinoceros. I cannot vouch for the absence of non-scientific friction between Indonesian and Dutch scientists, but I saw none; delegates from the USSR had their say as scientists, not as Soviets. I could not possibly attend all sessions – there were always several going on at the same time – but in my observation all who spoke up, formally or informally, spoke for themselves, giving no political twist to the tongue. There was no overt jockeying for nationalistic advantage.

Some Congress time was spent, to be sure, on picking over the minutiae of scholarly dissertation. But by and large the Congresses give much thought to "the elementary common purposes shared by all peoples": the quest for adequate nourishment, health, economic security, ways of life with personal meaning and cultural validity, and freedom from fear of aggression. In my opinion, the more that future Pacific Science Congresses demonstrate the leadership of science in attaining these goals, the more they will prove their value.

The Tenth Pacific Science Congress will convene in Honolulu in 1961. Proving its capacity to meet changing needs and to grow, it will probably give the geographers their own division. It is the hope of many that the Pacific Countries of Central and South America will send delegates. I will conclude this unintended editorializing by putting on record my hope for the recognition of science interpretation as deserving of a larger place on the agenda. The suggestion is inspired by the thought-provoking paper by Donald S. Mayo, Extension Editor, University of Hawaii, entitled "Presenting the Results of Scientific Research: An Editor's Plea for Plain Language for Plain People." Isn't this where *Pacific Discovery* comes into the picture?

Undisturbed in the sunlight, an entrance in Prah Khan, another of Angkor's ancient temples, is shown in this photograph by the author.

Congressmen at large

Adjournment day brought, after two weeks of crowded schedules, various feelings to various delegates. Those able to stay over for post-session tours were anticipating visits to Chiengmai and Angkor. In Pre-Discovery, *PD's* November-December 1957 issue, I referred you to Bernard Groslier's magnificent new book, *Angkor.** Since then I have been to Angkor. Now I can confirm, and emphasize, my commendation of the book. Angkor is a thing of this world you should know. It is good for the soul; it strengthens one's faith in man's ability to accomplish great and wondrous things. If you cannot go there, get the book; if you have been there, get the book – next to your own memories it will be the best possible memento, and it will give you understanding of what you saw.

As our Royal Air Cambodge DC-3 circled the landing strip at Siem Reap, we strained for a sight of stone towers, but our first glimpse of Angkor was from the hotel windows. The spires of the Great Temple topping the jungle horizon to the north, were pointed out to us. In a few minutes we were in the tour bus and on our way. During the Congress, whenever post-session objectives were being discussed, Angkor always headed most "Congressmen's" lists. For many of us it had been a dream for years. Now it was miraculously within reach.

*American edition published by Frederick A. Praeger, Inc., New York, 1957.

ASTRONOMY

LANDSCAPES OF THE FUTURE

Conducted by George W. Bunton & Charles F. Hagar

A "POETICAL MATHEMATICIAN with a paintbrush," is the description used by famed rocket expert Dr. Willy Ley in characterizing Chesley Bonestell, Pacific Coast astronomical artist. More than thirty of his paintings were recently displayed at the California Academy of Sciences in Golden Gate Park.

It takes more than an artistic eye and an ability with oils to correctly depict Saturn as viewed from its largest satellite, Titan. It requires a knowledge of linear and spherical perspective, shades, shadows, reflections, light and color, and a certain "photographic" technique that few people possess. These techniques and abilities are skillfully blended by this native Californian who has come into prominence as the foremost space artist of all time.

From the studio of this mild-mannered artist come some of the most spectacular views of outer space. The viewer is carried aloft by Bonestell's paintbrush to see rockets blasting through space; satellites hovering over the Caribbean; the moon from a precipitous crater rim; Saturn's rings arching across a sky dotted by drifting ammonia clouds; a space ship landing on the red sands of Mars.

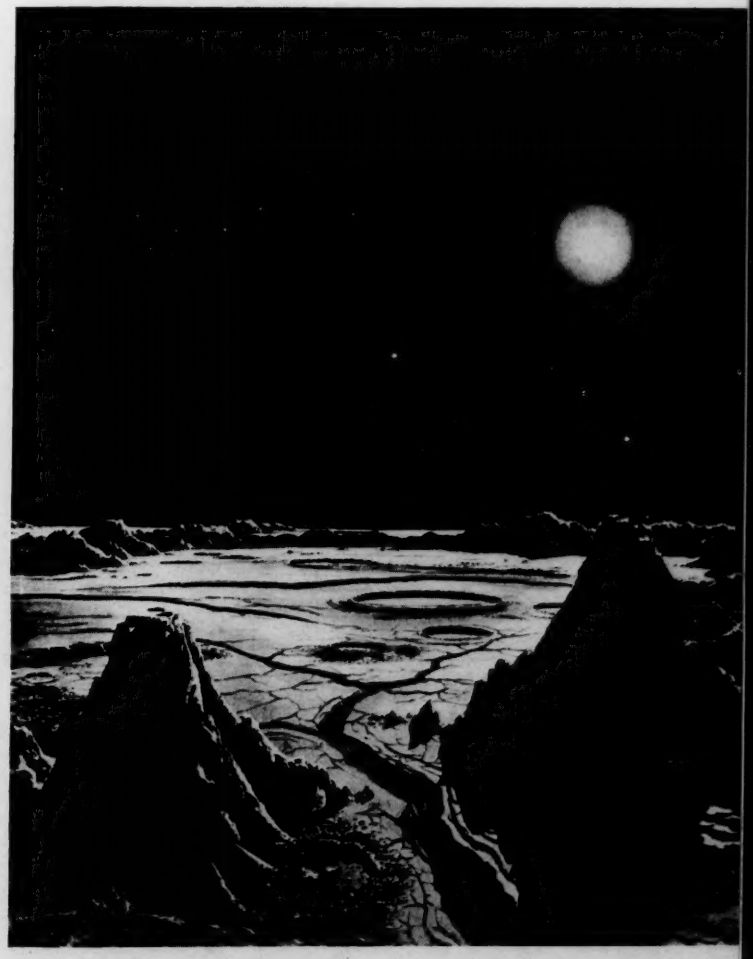
In viewing these paintings one is inclined to believe that he is looking at the first public showing of color photographs taken by a rocket crew just back from a tour through the solar system. Indeed, at one of the public showings of his work, a youth scratched one of the astro-scenes with a penknife to see if it was a photograph. Since that time Bonestell insists that all his paintings be exhibited under glass or just out of reach.

Chesley Bonestell (pronounced Bon-eh-stell) lives with his wife in a modest home in Altadena, and describes his paintings with an off-hand gesture as "this stuff I'm doing now." He recalls that his interest in astronomy was sparked when he was just a boy of ten in San Francisco. "That's when I first really noticed Venus; it was so bright, and I wondered why. I began reading books on astronomy at the library and visited Lick Observatory at Mt. Hamilton on weekends with the money I received for drawing sketches illustrating articles in an early San Francisco magazine."

Bonestell considers himself a San Franciscan. His grandfather was a San Francisco pioneer in 1849, and both of his parents were born there. He showed an early interest and ability in art and was sent to Columbia University to study architecture. After graduation he returned to San Francisco where he learned the technique of oil painting in just two weeks under Spencer Macky of the San Francisco Art Association. The great earthquake and fire of 1906 completely wiped out his home and paintings.

After World War I, he went to London where for five years he was a special artist for the Illustrated London News and London evening papers. In 1927, he was in New York doing architectural renderings of most of the big skyscrapers. This was a specialized field where blue prints of a proposed building were turned over to him, and he made paintings that showed how the building would look when completed.

Then the depression struck, and he made his way back to San Francisco, arriving with only ten cents in his pocket. With his ability, however, he found work again and became director of color schemes for the War Memorial Opera House. Soon afterwards, his talent in architectural renderings found him translating the intricacies of the Golden Gate Bridge – then in the blue print stage – into perspective views so that the directors of the project could see how the bridge was to be built. Around 1936 he was working on promotion drawings for the 1938 San Francisco Exposition.



Almost photographic in appearance, this Bonestell painting shows a landscape on sun-burned Mercury. The sky is black because of the lack of atmosphere on the planet. Courtesy "Conquest of Space" by Chesley Bonestell and Willy Ley, Viking Press.

Van Allen, architect for the Chrysler Building in New York, recommended Bonestell to RKO studios in Hollywood. At the Hollywood studios he developed a photographic technique while working in the special effects department. One of his matt backgrounds was used in the "Hunchback of Notre Dame" with Charles Laughton. Laughton is in the foreground with the powerful gothic architecture of Notre Dame Cathedral rising behind him. It looks exactly as if it were taken on location, but actually the cathedral was a product of Bonestell's brush. He painted it in just a few days thereby saving the expense of sending an entire camera crew from Hollywood to France and back again.

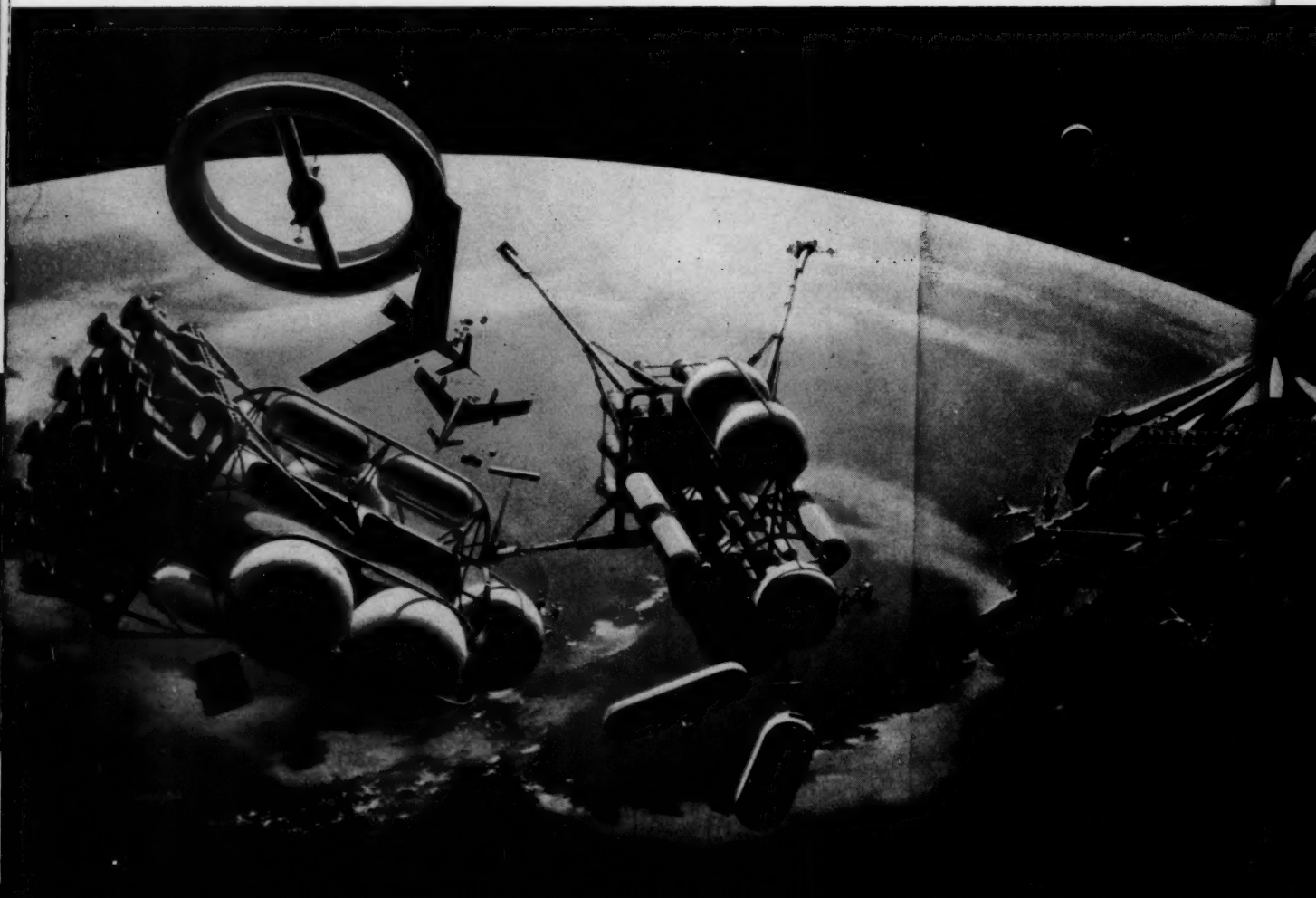
During the 1940's Bonestell began to think of the paintings of the moon and planets that he used to do to amuse the children of his friends. "Why don't I apply my photographic technique to paintings of astronomical subjects?" he mused. Interest in space and rockets was accelerating after the war years, so he gave up his RKO studio job and went to work for himself.

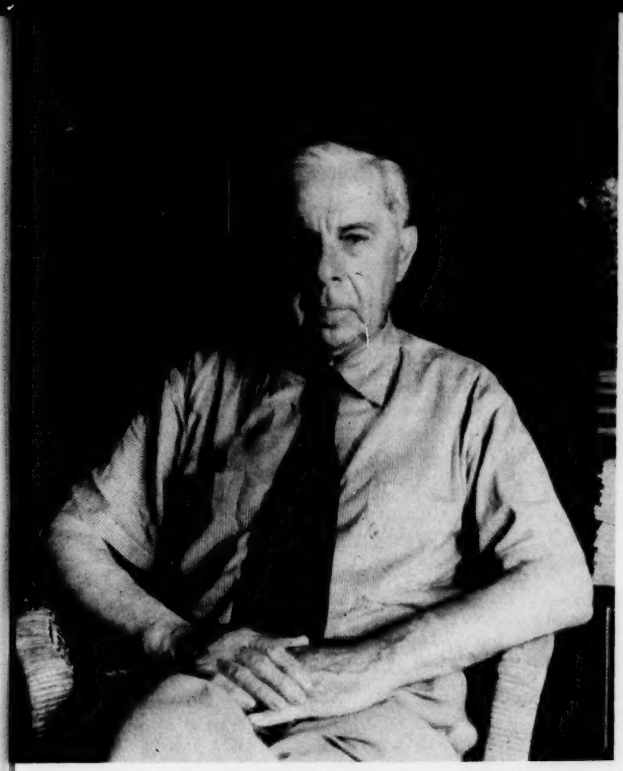
A series of views of Saturn from its satellites soon appeared in *Life*. Several of the major Hollywood studios were planning films on space travel, and Bonestell was much in demand to do backgrounds that would look like the real thing. *Collier's* magazine had him do a series of paintings depicting flight into space which later was published in book form and in which he collaborated with such famous rocket experts and astronomers as Werner von Braun, Willy Ley, Fred Whipple, and Heinz Haber, complementing their well-written texts with sparkling space scenes.

When space travel comes — and it's just around the corner — some of us will have to stay behind, but we all can get a glimpse today of what the rocket crews of tomorrow will see from their vantage point in space by looking through the magic windows painted for us by this "poetical mathematician with a paint brush."

C.F.H.

Right, the astronomical artist, Chesley Bonestell, at his Aladena, California residence. Below, workers in space suits, weightless in orbit 1,075 miles above earth, assemble three moon ships in this Bonestell painting. The Hawaiian Islands are shown below while winged transports unload supplies near wheel-shaped space station top left.





SKY DIARY

March, April, 1958

(Pacific STANDARD Time used throughout)

Phases of the Moon

Full Moon	March 5	10:28 A.M.
Last Quarter	12	2:48 A.M.
New Moon	20	1:50 A.M.
First Quarter	28	3:18 A.M.
Full Moon	April 3	7:45 P.M.
Last Quarter	10	3:50 P.M.
New Moon	18	7:23 P.M.
First Quarter	26	1:35 P.M.

Eclipses

April 18—**Annular Eclipse of Sun;** *not* visible from United States; path through Indian Ocean, Siam, Formosa, North Pacific (4:24 to 10:29 P.M.).

May 3—**Partial Eclipse of the Moon:** Moon enters umbra at 3:59.6 A.M.; middle of eclipse at 4:12.9 A.M.; Moon leaves umbra at 4:26.1 A.M.; Moon sets at San Francisco at 5:12 A.M.

The Planets

Mercury: March 3, Superior conjunction; **28,** Greatest eastern elongation (mag. −0.2) well placed for observation above western horizon just after sunset. **April 16,** Inferior conjunction.

Venus: Above eastern horizon before sunrise. **March 4,** Greatest brilliancy (mag. −4.3) rises at 4:30 A.M.; **16,** In conjunction with the moon at 3:00 A.M. (separation 1° 17′); **April 8,** Greatest western elongation, rising about 3:50 A.M.

Earth: March 20, Spring begins at 7:06 P.M.

Mars: Visible above southeastern horizon. **March 1,** rises at 4:20 A.M.; **31,** rises at 3:30 A.M. (mag. + 1.1), in Capricornus; **April 30,** rises about 2:30 A.M.

Jupiter: March 1, rises almost due east at 10:00 P.M.; **30,** rises about 7:50 P.M.; **April 16,** Opposition, rises at sunset (mag. −2.0) and visible throughout the night.

Saturn: March 1, rising in southeastern sky about 2:20 A.M., just north of the tail of Scorpius; **16,** in quadrature (90° west of the sun) rising 1:30 A.M.; **April 30,** rises about 10:30 P.M. (mag. + 0.5).

C.F.H.

From the astronomer's bookshelf

And There Was Light. — The Discovery of the Universe. By Rudolf Thiel. Alfred A. Knopf, Inc., New York. 437 pp., 54 photographs, 73 line drawings, appendix, and index. $6.95.

Ever since man first looked at the sky and wondered *What* and *Why,* he has tried to fit together the elusive pieces of the giant jigsaw puzzle of the universe. This engrossing history of astronomy is a record of his efforts to supply piece after piece to this ever-evolving picture. We are introduced to player after player, from Hipparchus, Ptolemy, and Copernicus to Galileo and Newton to Albert Einstein, and we fascinatedly watch (and, perhaps, kibitz a bit) while they select, discard, and reselect piece after piece. Occasionally, progress seems to be at a standstill for varying periods, but bit by bit the picture takes form until we

are brought to the belief-defying present, when after the picture seemed almost complete, it appears that only an infinitesimal fraction of the whole puzzle has been worked.

Rudolf Thiel (who, according to the publishers, spent six years compiling the data for this book) is to be commended on the thoroughness of his research. The evolution of astronomy as a science is presented with compactness and clarity, from its ancient mystic beginnings in astrology to the advent of today's man-made satellites whizzing about us in space. Concepts of various cosmologies are accepted, rejected, adapted and readapted by the inquiring minds of astronomers, physicists, and mathematicians, and Thiel manages to transmit the excitement of their discoveries and conclusions to the reader with rare enthusiasm and verve.

So well translated from the original German by Richard and Clara Winston that the reader is unaware of the translation, *And There Was Light* provides recurrent pleasures, not only in context but also in concept. The book s format is a delight. The many fine line drawings cover a diversity of material from equally diversified and interesting sources — engravings, miniature paintings, and woodcuts ca. the 13th, 14th, and 15th centuries, a contemporary drawing by Miguel Covarrubias, and many pen and ink sketches and diagrams by the author. Imaginatively conceived and executed, it is a pleasure to peruse. L.L.R.

Wildlife and conservation

The Great Chain of Life. By Joseph Wood Krutch. Houghton Mifflin Co., Boston. 1957. 227 pp. Illustrated. $3.75.

This well-written and nicely-illustrated small volume may at first appear to be another to add to our collection of sensitive observations of nature, to be placed on the shelf next to the books of Edwin Way Teale, John Kieran, Roger Tory Peterson and Donald Culross Peattie. And we may place it there, if we take as implicit in these others the thesis that Man misunderstands Nature and especially his *own* nature, and even fails to see the relationship between the two. If not, then Krutch's book belongs in a place of its own.

If Man could come to the full realization of this relationship there would be no problems of cruelty to animals (especially to his own kind), of misuse of natural resources, and of his own survival, at the moment so perilously balanced.

Krutch presents a wide variety of information under the guise of informed speculation. In his presentation, his theme is explicit. His fine essays on the Volvox, the salamander, and the Sacculina are an exciting "challenge to the purely mechanistic theory of evolution," that of natural selection.

The reader who has an interest in the processes of life around him will definitely benefit from Krutch's fresh thinking, especially in such instances as his point that natural selection does not explain everything, and, further, in his own words: "since no necessarily enduring distinction exists between matter and energy, the distinction between 'material' and 'non-material' has ceased to exist." A.S.R.

America's Natural Resources. Edited by Charles H. Callison. The Ronald Press Company, New York. 1957. v + 211 pp. $3.75.

Two observances, National Wildlife Week from March 16 to 22 and California Conservation Week from March 7 to 14, make the reading of this collection of essays on America's natural resources especially timely right now. Editor Callison, chairman of the editorial committee of the Natural Resources Council of America which sponsored the book, has divided it into eleven chapters, each of them the work of a recognized authority on natural resources and conservation.

The introductory and the final chapters deal with natural resources and their conservation and renewal in a broad, general way. In between, the remaining nine chapters are each concerned with a specific resource.

They are Soil, Water, Grasslands, Forests, Wildlife, Fish, Parks and Wilderness, and Land Use Principles and Needs. The authors of these chapters have nothing particularly new to say and, as a result, the book, at first, may not seem very exciting. The total effect of the book, however, creates excitement by pointing up to the reader the absolute truth of what the writers say and the absolute necessity of what they advocate. Perhaps the book seems to lack a little zest because readers will find themselves nodding in agreement with almost everything the writers say: thinking readers will find it nearly impossible to argue with the material presented.

In his preface, Callison says "More and more Americans are developing an appreciation for, and a conscience about, the natural resources of their continent." This book is designed to meet the need of those who are concerned but who lack the background for an informed approach to the problems of conservation.

The authoritative writers who supply the material to meet this need are Shirley W. Allen, Fairfield Osborn, Firman E. Bear, H. G. Wilm, David F. Costello, Henry Clepper, Lowell Besley, Joseph J. Shomon, Albert S. Hazzard, William Voigt, Jr., Howard Zahnisher, Edward H. Graham, Ira N. Gabrielson and, of course, editor Callison. Appendix B offers biographical information on them.

Appendix A is the Natural Resources Council's Policy for Renewable Natural Resources, a policy which in every way makes good sense. G.B.B.

A Flora of the Marshes of California. By Herbert L. Mason. University of California Press, Berkeley. 1957. 878 pages. Illustrated. $10.

There has long been a need for a botanical work dealing with the plants of California that grow in aquatic and near aquatic habitats. Two works dealing with aquatic plants — *Aquatic Plants of the United States* by W. C. Muenscher and *A Manual of Aquatic Plants* by N. C. Fossett — are not entirely satisfactory for use in this state. *A Flora of the Marshes of California* includes not only wholly aquatic plants but those which occur on "wet lands," and in addition those "marginal to these habitats that are known to enter significantly into the food habits of waterfowl." These plants are almost entirely flowering plants with the exception of a few genera of ferns. Many of them are native to California but it is of interest to note the number of introduced weedy species which are included, particularly those which have come into the state through rice culture.

Habitats for these plants occur throughout California and Professor Mason's approach to considering their ecological relationship has been from the standpoint of habitat rather than from occurrence in a particular plant community. An outline is provided in the introduction to these major habitats and for each species in the text there is given its habitat or habitats within the geographic range of the species. These are stated in general terms as is always done in manuals or floras of regions. Detailed information as to habitat or geographical range, for those interested, would be found in the references to literature citations for those genera for which such information is available.

A general key to the families is provided as well as keys and descriptions to the genera and species. Common names

FROM THE READER

Editor, *Pacific Discovery:*

The question "What do seals drink?" has been raised before. It is well known, of course, that the "lower" marine animals, such as fish, contain a considerable quantity of liquid. During the war, one of the recommended survival techniques, when water was not available, was to catch fish, cut them up into small pieces and squeeze the liquid out for drinking purposes. It is assumed that most of the liquid required by marine pinnipeds is obtained from this source. We have never seen a bull seal on harem duty drink from puddles of rain water. In fact, many of those which remain for so long on shore are not in areas where such pools of rain water are available.

It was observed by K. G. Brown that when the cage of a captive leopard seal was dragged into the sea the animal drank large quantities of sea water.

The foggy, moisture-filled atmosphere prevailing on the Pribilof Islands during the breeding season of the seals undoubtedly aids in preventing excessive moisture loss of fasting seals. Perhaps this is one of the primary reasons that fur seals are found in the regions having a damp summer climate which would aid in survival during long periods when the sea is not visited by the harem bulls.

More information on this subject is included in a paper entitled "Seals, Sea Lions and Walruses: A review of the Pinnipedia" soon to be published by Dr. Victor B. Scheffer, (Stanford University Press).

KARL W. KENYON

Seattle, Wash., 7 Feb. 1958

Editor, *Pacific Discovery:*

Your January issue contains an article about killer whales by K. S. Norris in which he mentions the possibility of battles between sword-fish and killer whales. I believe I saw a fight between a killer whale and a Manta Ray.

In January, 1943, I was an officer on the USS Fanning (D.D. 385) and we were returning at high speed to Noumea, New Caledonia. . . .

Suddenly we saw a giant Manta Ray leap clear of the surface and make three or four more leaps landing on the surface with a very audible smack after each leap. Several minutes later a killer whale leaped clear of the water and jumped twice himself. . . . Each leaped several more times just seconds apart. We gradually drew abreast of them when the killer whale turned to a vertical position in the water and thrashed the water with his tail. He continued in this manner for almost five minutes with only his tail out of the water and thrashing wildly.

We assumed that he had hold of the Manta or vice-versa and was shaking it for this long period. As the ship sped on and the whale's movements went out of visual range, we could still see the water churning. . . .

Granted my assumptions are large, what other explanation for the mad chase could there be?

EDGAR N. STONE

San Francisco, Calif., 24 Jan. 1958

---

are given when available. The illustrations are excellent and are a very valuable feature of the book. Accompanying the key to the families are drawings to illustrate some of the characters used. Most of the species are illustrated with detailed drawings. A glossary defining the botanical terms as they are used in the body of the text, with several accompanying text figures, is also provided.

The volume is convenient and usable in makeup and an authoritative treatment of California's marsh plants and forms a valuable addition to the literature of the plants of this state.

E. McC.

EASY CHAIR COMFORT

LONG RUGGED WEAR

LEVI'S

AMERICA'S FINEST OVERALL
Since 1850

BOOKS BY MAIL
. . . *from the Academy*

THE CALIFORNIAN WILDLIFE REGION
by Vinson Brown **$2.15**
A simple, easy introduction to the common wild animals and plants of the Californian Wildlife Region. More than 500 illustrations are included. Paperbound.

BIRDS
by Herbert S. Zim and
Ira N. Gabrielson **$1.10**
One of the Golden Nature Guide series, this book deals with 125 of the most familiar American birds. Beautifully illustrated in full color by James Gordon Irving. Paperbound.

A FIELD GUIDE TO THE MAMMALS
by W. H. Burt and
R. P. Grossenheider **$4.20**
This book, one of the Peterson Field Guide series, enables the user to quickly and easily identify any mammals he might encounter in North America north of Mexico. Some 187 species are illustrated in full color.

All prices as shown above *include* tax and postage.

Send order and check or money order to:

CALIFORNIA ACADEMY OF SCIENCES
Golden Gate Park, San Francisco 18, California

Standard tries a flood of fire to make worn out oil fields produce again

Fire flooding produces heat and pressure to boil out previously unrecoverable crude oil, driving it underground to nearby producing wells.

MANY INACTIVE WELLS STILL HAVE LOTS OF OIL left underground in spite of the industry's great advances in oil recovery. Our country must have this oil to meet the growing power needs of industry, the Armed Forces and motorists. That's why Standard is trying a new conservation experiment called "fire flooding."

We ignite some of the oil in a pool . . . control burning by regulating the air supply. Heat and pressure drive the oil to surrounding wells for pumping. It will take more than a year's time and a million dollars to see if fire flooding works. It's worth the effort because it could add more to U.S. underground oil reserves than the discovery of an entire new oil field.

Progress in the West means...

Helping find new sources of oil to supply the 13 million barrels per day the U.S. will need in 1966

1956	1966
8,827,000 barrels per day	13,000,000 barrels per day

Standard's petroleum engineers say, "Back in 1925 the industry could predict only about 20% recovery from a new field. Modern secondary recovery methods, of which fire flooding is one of the latest, could more than double recovery."

STANDARD OIL COMPANY OF CALIFORNIA

plans ahead to serve you better